Minerals Yearbook 1967

Volume IV

AREA REPORTS: INTERNATIONAL

Prepared by staff of the
BUREAU OF MINES

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UNITED STATES DEPARTMENT OF THE INTERIOR • Stewart L. Udall, Secretary

BUREAU OF MINES • John F. O'Leary, Director

Created in 1849, the Department of the Interior—America's Department of Natural Resources—is concerned with the management, conservation, and development of the Nation's water, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that parks and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States—now and in the future.

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Foreword

This edition of the Minerals Yearbook, covering calendar year 1967, marks the 86th year in which the Federal Government has issued, on an annual basis, a report on the U.S. mineral industry. In response to the desires of our readership, this 1967 edition has returned essentially to the Yearbook format in use prior to 1966, with some minor modifications. The general content of this edition follows:

Volume I–II, Metals, Minerals, and Fuels, contains all the chapters on the metal, nonmetal, and mineral fuel commodities that previously appeared in the separate *Volume I, Metals and Minerals,* and *Volume II, Mineral Fuels.* In addition, it includes a chapter reviewing these mineral industries, a statistical summary, and chapters on employment and injuries, and technologic trends. As in Yearbooks prior to 1966, text accompanies the statistical presentation. Some of the longer chapters have been redesigned so that the tabular presentation follows the text, rather than being interspersed throughout the text as in the past.

Volume III, Area Reports: Domestic, contains chapters covering each of the 50 States, the U.S. island possessions in the Pacific Ocean and the Caribbean Sea, the Commonwealth of Puerto Rico, and the Canal Zone. Volume III also has a statistical summary chapter, identical with that in Volume I–II, and a chapter on employment and injuries.

Volume IV, Area Reports: International, which was not published in 1966, has been reinstated. This volume contains 85 chapters presenting the latest available mineral statistics for more than 130 foreign countries and areas, and discusses the importance of minerals to the economies of these nations. A separate chapter reviews minerals in the world economy.

The continuous effort of the Bureau of Mines to enhance the value of the Yearbook for its readership can be aided by comments and suggestions from its users; such comments are invited.

JOHN F. O'LEARY, *Director*

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Acknowledgments

The individual chapters of this volume were prepared by the staff of the Division of International Activities with contributions from various members of the Foreign Service. Coordination and review of the chapters within the Division was by Charles L. Kimbell and E. J. Gealy, assisted by Berenice B. Mitchell and Jane Doughman. Final correlation and checking of this volume was performed by the Minerals Yearbook staff under the direction of Kathleen J. D'Amico.

Gratefull acknowledgment is made for the information and basic data on mineral commodity production and trade which was obtained from foreign mineral agencies, official publications on statistical data and other subjects issued in various countries, publications of the United Nations, despatches of the Department of State, and from both the domestic and foreign technical press. Indispensable to the preparation of this volume were the routine and special reports received from technical, mineral, and petroleum attachés and other members of the embassy and consular service of the Department of State and their contribution is deeply appreciated.

The regimes of some of the countries and areas reviewed in this volume are not recognized by the U.S. Government. The information contained herein is technical and statistical and is not to be construed as conflicting with or contradicting U.S. policies toward these countries.

ALBERT E. SCHRECK,
Editor-In-Chief

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Minerals in the World Economy

By E. J. Gealy [1] and C. L. Kimbell [2]

The continued expansion of the world economy in 1967 again placed a greater demand for raw materials upon the world's mineral producing industries. As in past years, the mineral extractive and processing industries responded with a larger output of both fuels and nonfuel minerals.

There were several factors of a sociopolitical nature which disturbed the operation of the world mineral industry to a significant degree. The Arab-Israeli war, which lasted only a few days before a cease-fire was invoked, resulted in a serious dislocation of world petroleum supply patterns. Although the demand-supply balance was restored relatively quickly, the interdiction of Suez Canal traffic and the temporary closure of several major international pipelines, since reopened, resulted in a serious oil transport problem. The swing to supertankers, which do not use the canal route, was accelerated and intensified.

Conflict in Viet-Nam resulted in a higher than normal demand for munitions and war materials, including steel, copper, aluminum, fuels, and other minerals. The financial effect of the Viet-Nam war upon the United States economy was a factor in the limiting controls, first voluntary and then mandatory, placed upon U.S. direct foreign investment flows. Because much of this investment is in minerals, particularly petroleum, the impact of this action may be felt for many years. Although U.S. firms have continued to invest, much of the financing has been raised outside the United States.

The internal unrest in China apparently had a significant depressing effect on that country's mineral industry. As China is a major producer of coal, the drop in the estimated output of this fuel significantly lowered total world output. Likewise, China's production of steel appears to have declined significantly.

The shortage of copper, accentuated by the strike in that U.S. industry, resulted in price dislocations; increased production and releases of stocks at least partly restored the balance. The U.N. embargo upon trade with Southern Rhodesia, honored by United Nations members in the main, caused some dislocation in world supplies of chromite. The revolution of Biafra in Nigeria seriously debilitated what had been rapidly expanding petroleum production from that area. The accelerating demand for gold by some nations and by private speculators threatened the stability of world money markets.

In spite of these dislocations, mineral supplies were generally in balance, and prices for mineral materials were not significantly advanced, with only a few exceptions.

PRODUCTION

The value of world crude mineral production in 1967 was estimated at roughly $80,000 million, an increase of about $5,000 million over the 1966 level.[3] The value added by the processing of these materials in mineral industry plants on a worldwide basis is difficult to assess but probably was of the order of $200,000 million or more.

[1] Assistant to the Chief, Division of International Activities.

[2] Physical scientist, Division of International Activities.

[3] Estimates based on extrapolation of data for 1963 compiled for and published in Annales des Mines, No. 4, 1966, pp. 7–98. Extrapolation based on United Nations indexes of extractive mineral industry production presented in table 1 of this chapter, but allows for production by countries not covered by the United Nations indexes.

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PRODUCTION INDEX PATTERNS

United Nations production indexes for various sectors of the mineral industry for the world and for major groups of countries are presented in table 1. For the first time, this series includes data on the European Communist countries, reportedly on a comparable basis to that presented heretofore in the Minerals Yearbook for non-Communist countries only. This series of indexes indicates that in general, during 1963–67, world mineral industries have enjoyed a greater growth than that of total industry (including minerals) although the rate of growth for most mineral industry sectors has been decreasing during this period, and specifically in 1967. Moreover, although the index levels for 1967 as a whole were higher than in 1966, the quarterly indexes show little if any growth through the year.

The extractive sector of the world's mineral industry in general has not shown as great a growth as have the processing sectors, based wholly or primarily upon mineral raw materials.

Growth in indexes for metal mining and, to a lesser extent in base metals production, were somewhat retarded by the U.S. copper strike in the latter part of 1967, but the increase in world copper prices somewhat moderated the effect of the volume decline from the viewpoint of output value. Moreover the 1967 world steel output increase of about 3.5 percent, although slightly lower than that recorded between 1965 and 1966, was coupled with rising prices in the case of some producers (3.7 percent), and this tended to further improve the overall metals production index level. Lower reported world iron ore output presumably did not have a significant influence on the index for metal ore output for two reasons: First, a major part of the decline was the result of low estimated output in mainland China which is not considered in the index, and second, reduced output in the non-Communist world was largely in lower grade ores in Europe, which was compensated in terms of iron content (and value) by increased output of higher grade ores elsewhere.

The growth in the production index of nonmetallic mineral products to 136 (1963=100) was in keeping with virtually worldwide growth in construction industry activities. However, despite the fact that the 1967 index was appreciably higher than that of 1966, quarterly returns do not indicate continued growth but rather stability at the 136-point level throughout the year.

Among the mineral fuel industry sectors for which indexes are provided, coal mining in 1967 again registered a decline, mainly as a result of production cutbacks in non-Communist Europe aimed at economic rationalization of the industry in the face of competition from liquid fuels. Such reductions have exceeded continuing but modest gains registered elsewhere most notably in North America and Communist Europe. The United Nations index does not take into account output in mainland China, thus the severe reduction in the estimated output of that country in 1967 is not reflected in table 1.

The recovery in the world coal production index in the last quarter of 1967 was chiefly due to significant increases in North America and non-Communist Europe. This growth presumably represented efforts to insure an adequate fuel supply to non-Communist Europe in the face of possible further interruptions in the flow of Near East and North African oil to that area following the Arab Israeli crisis of mid–1967.

World petroleum and natural gas production indexes continued to advance at a significant rate through 1967, although the volumetric increase was not as significant as the index numbers, based on value, would indicate. The interruption of movement of lower unit value crude oil from the Near East and Northern Africa during and after the Arab-Israeli war, and the substitution of higher unit value crude from other areas, increased the index without a corresponding quantitative gain. Nonetheless, by yearend, world oil output had increased to a new record level.

The chemical, petroleum and coal product production index continued to increase in 1967, with all areas showing sizable gains led by the European Economic Community. This reflected, in part, the rising world demand for liquid fuel productions as well as an increase in chemical industry activity that is based to a significant extent on mineral raw materials.

QUANTITATIVE COMMODITY OUTPUT

Table 2 summarizes total world output

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of a number of mineral commodities for 1963–67, while table 3 gives the regional distribution of 1967 output of these commodities. Tables within the statistical summary of this chapter provide more detailed figures for output by major producers of selected major commodities.

World iron ore production declined 1.6 percent in 1967, but except for mainland China, which accounted for most of the total decline, a greater amount of contained iron was available to the steel industry as production of low-grade ores, chiefly in France, West Germany, and the United Kingdom, was reduced, while output of higher grade ores in less developed countries increased.

World steel output (ingots and castings) advanced by 3.5 percent in 1967, mainly as the result of the 14.4 million ton (30 percent) increase in Japanese steel production, to 62.2 million tons; the U.S.S.R. recorded a 5.3 million ton increase while the United States recorded a 6.2 million ton decline relative to 1966 performance.

Manganese ore output continued to decline modestly in spite of increased steel production as a result of use of higher quality iron ores and increased presmelting treatment (with an attendant lower manganese requirement) in steelmaking, wider adoption of new steelmaking technology, and reduced acquisition of manganese for stocks. India, Brazil, Gabon, and mainland China registered notable declines, which were partly compensated by increases in other countries, notably Republic of South Africa, the U.S.S.R., and Australia.

Aside from copper, world output of which fell as a result of the major U.S. strike that continued through yearend, most major nonferrous base metals showed increased output in 1967. Mine production of lead appeared to be off slightly from the 1966 level, but more complete returns may show a slight gain, Otherwise, both mine and smelter output of aluminum, lead, zinc, nickel, and tin increased.

Among precious metals, platinum output increased in 1967 in response to higher market prices, and additional increases were in the offing as new mines were readied for production. Gold output fell as the overwhelming dominant producer, the Republic of South Africa apparently passed the peak economic production level at the $35 per ounce price. Silver production also was apparantly lower than in 1966, chiefly as a result of a 12 million ounce drop in U.S. output which was evidently the result of lower byproduct output by the struck copper industry.

World sulfur production, both as native sulfur (Frasch produced and from ores) and as a byproduct from metal smelting and petroleum refining continued to increase in response to growing chemical industry requirements. Moreover, output of pyrite, another principal source of sulfur also increased.

Output of all three major fertilizer materials (nitrogen, phosphate, and potash) increased in 1967 as efforts continued to pace world population growth with agricultural product output. Natural nitrate output (entirely from Chile), however, continued to decline as competition from manufactured nitrates increased; Chilean nitrates accounted for less than 2 percent of total world nitrogen compound supplies in 1967.

On the basis of incomplete returns, world output of most other nonmetallic mineral commodities apparently increased in 1967, but some few commodities seemingly went counter to the trend, notably barite, graphite, and gypsum.

Preliminary data indicate that world production of energy commodities in 1967 reached a new high in terms of heat content, despite a 3.9 percent decline in world coal output (all grades, including lignite) relative to that of 1966. In terms of standard coal equivalent (SCE), total commerical fuel[4] output in 1967 was of the order of 5,800 million metric tons, about 2.8 percent greater than in 1966. Petroleum for the first time ranked ahead of coal in energy equivalent produced, as shown in the following tabulation:

Energy source	Percent of total energy production	
	1966 [1]	1967 [2]
Coal (including lignite)	41.1	38.5
Petroleum	38.6	40.3
Natural gas	18.1	18.9
Hydro and nuclear electricity	2.2	2.3
Total	100.0	100.0

[1] Based on United Nations. World Energy Supplies 1963–66, Statistical Papers, ser. J, No. 11, New York, 1968, p. 10.

[2] Estimates are based on extropolation of United Nations data from world production data reported to and published by the U.S. Bureau of Mines.

[4] Excluding wood, charcoal, bagasse, animal dung and other minor fuels.

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The 1967 decline in reported coal output was attributed chiefly to a precipitous drop in estimated production of mainland China (100 million metric tons) and a decline of 21 million tons altogether by France, West Germany, the Netherlands, and the United Kingdom; a number of producers including the United States and the U.S.S.R. showed significant output increases.

The growth in petroleum output was principally the result of increases of over 150 million barrels each by the United States, Iran, and the U.S.S.R., and increases of almost 75 million barrels by Saudi Arabia and Venezuela. Canada showed a 32 million barrel increase and Muscat and Oman, not listed among producers in 1966, recorded a 23 million barrel output, further swelling the world total. The Arab-Israeli crisis of June sharply restricted output in Kuwait, Libya, and Algeria for a brief period, and as a result, these countries showed only modest increases relative to their 1966 performance. Among major Arab-world producers Iraq and the Kuwait-Saudi Arabia Neutral Zone were more severely affected, recording declines compared with their 1966 output.

The growth in recorded natural gas output was chiefly attributed to the United States (up 1.0 million million cubic feet), the US.S.R. up 0.5 million million cubic feet), and the Netherlands (up 0.136 million million cubic feet), although most world producers showed gains.

TRADE

GENERAL TRENDS

Spurred by increasing quantities of material moved and by higher unit prices for some commodities, world trade in mineral commodities in 1967 unquestionably exceeded the value level of total world mineral commodity exports in 1966, but owing to far-from-complete reporting on 1967 movements, it was impossible at this writing to assess the amount of increase and the total 1967 value.

In 1966, the last year for which reasonably complete trade returns are available on a worldwide basis, mineral commodities traded had an estimated value of over $53,250 million, about 6.7 percent greater than in 1965 and equivalent to about 26.2 percent of the value of all commodities traded. Comparable figures for recent years were as follows:

Year	Estimated value of mineral commodities traded (million dollars)	Increase relative to previous year (percent)	Mineral commodities' share of all commodities traded (percent)
1963	40,300	18.6	26.2
1964	45,740	13.5	26.6
1965	49,890	9.1	26.8
1966	53,250	6.7	26.2

The foregoing estimates represent a summation of the recorded value of major mineral commodities traded and reported from United Nations sources in table 4 and a factor added for trade in other mineral commodities not included in that table; this added factor has been derived by comparison of total mineral commodity trade value data included in selected country chapters with the total recorded for these countries in table 4; this comparison indicated that the recorded major mineral commodities traded represented 78 percent of total mineral commodities traded.

COMMODITY GROUP TRADE PATTERNS

Although the share of total commodity trade accounted for by mineral commodities has varied but little since 1963, the relative share accounted for by major commodity groups has shown a small but steady shift favoring metals, as indicated in the following tabulation:

Year	Share of total listed [1] mineral commodity trade (percent)		
	Metal ores, concentrates and scrap	Metals	Mineral fuels
1963	11.6	38.4	50.0
1964	12.2	40.1	47.7
1965	11.8	42.1	46.1
1966	11.7	42.4	45.9

[1] As given in table 4 of this chapter.

The relative decline of mineral fuels' importance and increasing importance of metals during 1963–66 is evident; this pattern likely was altered in 1967 follow-

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ing the Near East crisis as a result of increased markets of oils with a higher unit price to the European markets to replace lower priced Near East oils. Movement of higher unit price copper resulting primarily from the prolonged U.S. copper strike may also have influenced the 1967 figure, but reduced shipment levels may have negated increases owing to the higher unit price.

REGIONAL TRADE PATTERNS

Data on world trade in major mineral commodities (metal ores and concentrates, metals, and mineral fuels) are presented in tables 4 and 5, the former showing export and import totals by commodity group and continental area, the latter showing the distribution of these totals by trading partner areas and/or countries.

The countries of the European Economic Community (EEC) increased their aggregate annual trade deficit in major mineral commodities from $2,375 million in 1965 to $3,170 million in 1966. This area, which accounts for about two-fifths of world exports and over half of world imports of these commodities on a value basis, increased exports of these materials to non-EEC countries by only $70 million in 1966 relative to that of 1965, while increasing imports from non-EEC countries by $865 million. As a result, the Community's share of world exports of these commodities declined marginally because of the greater increase rate in the world total, while its share of imports increased slightly. Of total EEC trade in major mineral commodities in 1966, trade between the member nations accounted for 51 percent of exports and 37 percent of imports, compared with 1965 figures of 49 percent for exports and 38 percent for imports. The value of major mineral commodities traded between EEC countries increased from $3,990 million in 1965 to $4,395 million in 1966.

For the European Free Trade Association countries as a group, the aggregate annual deficit in major mineral commodities increased from $2,835 million in 1965 to $3,000 million in 1966, but in contrast to the EEC, these countries accounted for a greater percentage of world exports and a smaller share of world imports of these commodities. Trade in major mineral commodities among EFTA nations increased by $92 million in 1966 to $928 million.

Communist European countries bettered their positive trade balance in major mineral commodities between 1965 and 1966, increasing their net inflow by $165 million to $3,000 million. Trade in major mineral commodities within the group of countries declined by $110 million in 1966 to $2,910 million, while exports to other countries increased by $275 million to $1,975 million and imports from other countries increased by $135 million to $705 million.

Among major non-European developed countries, Canada, South Africa, and Australia recorded significantly higher values of major mineral commodity exports in 1966 than in 1965, and on a percentage basis, Canada and Australia provided a larger share of the world total in 1966 than in 1965. These three nations also all recorded a smaller share of total world imports of these commodities in 1966 than in 1965. Both South Africa and Australia had an actual lower value of such imports, while Canada recorded a figure on a par with that of 1965.

Japan's deficit in major mineral commodity trade in 1966 totaled $1,328 million, approximately $493 million greater than in 1965, as a result of a $495 million increase in value of imports compared to only a $2 million increase in exports of these materials.

The less-developed countries of the world showed quantitative increases in value of both exports and imports of major mineral commodities in 1966 relative to their 1965 performance, not only in overall total, but also in total for each of the major areas—Latin America, Africa, Near East, South Asia, and the Far East. However, in each of these areas and in total their percentage share of world imports of these materials declined, possibly indicating a widening of the gap between them and the developed countries. In the case of exports of major mineral commodities, the less developed countries of Latin America and Africa accounted for lesser shares of the total in 1966 than in 1965, while those countries of the Near East and South Asia and the Far East increased their role on a percentage basis.

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CONSUMPTION

NONFUEL MINERAL COMMODITIES

World Consumption of most nonfuel mineral commodities, both metals and nonmetals, advanced in 1967 on a total tonnage basis, but on a per-capita basis, it is indicated that advances were more modest and less numerous. Notable departures from the trend were apparent for iron ore (on a gross weight basis) and copper ore and metal. In the case of iron ore, the increased output of higher grade ores and increased use of scrap in some areas made possible increased steel production despite the decline in tons of ore consumed. In the case of copper, the strike closure of smelters in the United States led to lower consumption of copper ore by industry and an attendant shortage of copper metal on world markets. The decline in copper consumption probably stimulated some of the increased use of other metals as these were substituted.

Apart from these downturns in consumption, some few minor metals presumably were used in lesser quantities in 1967, and requirements for some nonmetals may have fallen off, but such downturns were more than compensated by increased use of other mineral commodities.

Data on world consumption of major nonferrous metals appears in table 6.

MINERAL FUEL COMMODITIES

In 1966 total world energy consumption in terms of standard coal equivalent reached a new high of 5,509 million metric tons as shown in table 7. As of that year solid fuels (coal and lignite) continued to be the major energy source with a 41.7 percent share of the world market. Petroleum continued as the second fuel with 37.7 percent, natural gas third with 18.4 percent, and the few remaining percent of the market were shared by hydrogenerated and nuclear-generated electricity. Although data are not available for 1967 world consumption, information covering production leads to the conclusion that the consumption of solid fuels and petroleum were about equal in that year. The modest annual increase rate of coal consumption recorded in recent years was probably eroded by the sharp reduction in available quantities in China. Part of this loss was made up by an increased demand for coal in Western Europe resulting from the mid–1967 oil crisis. Within this latter area sufficient stocks of coal were being held to permit increased consumption without requiring a commensurate gain in production. Petroleum consumption gains on a world basis appear to have continued relatively unaffected by the European supply problems.

Increase in energy consumption by major world areas during 1963–66 roughly coincided with the shares of total energy consumed as shown in the following tabulation:

	Percent	
	Increase share 1963–66	Total share 1966
North America	37	37
Countries not specified (Includes U.S.S.R.)	32	30
West Europe	14	20
Far East (includes Japan)	8	6
Other areas	9	7
Total	100	100

A continuation of the trends established during this period would result in a decline in Europe's share of total energy and a growth in the share of the Far East. North America's share would remain the same while that of unspecified countries (including the U.S.S.R.) would grow slightly. Other areas, including Western Asia, Africa, and other America (South America less Colombia and Venezuela), would be able to increase their total share about as fast as would the Far East which includes Japan. Regardless of the differences in the rate of increase, it is noteworthy that all areas during 1963–66 participated in the world growth of energy consumption.

Further examination indicates that the rates of increase of the aggregate for North America and Western Europe, which are relatively heavily industrialized, were among the lowest. However, in terms of per-capita increase, Caribbean America (including Columbia and Venezuela), Other America, and Africa were at the lower end of the spectrum.

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INVESTMENT

Although comprehensive data on world investment in mineral industry operations are not available, there are a number of sources of partial data on investment in certain geographic and commodity subject areas that clearly point to continued overall growth in investments during 1967.

Table 8 summarizes steel industry investment expenditures for countries and groups of countries within the Organization for Economic Cooperation and Development (OECD) and indicates a 7.5-percent increase in such expenditures by the listed countries in 1967 relative to the 1966 level, compared with a 5.8-percent growth in 1966 relative to that of 1965.

These steel industry investments in general have been for overall modernization and economic rationalization of the industry rather than for sizable expansion of total capacity. It is indicated that this trend will continue in the near future. Erection of additional oxygen steel process equipment and iron ore sintering and pellatizing plants were technologic areas receiving relatively high proportions of total funds invested, not only within the countries of the OECD, but in other steel producing areas as well.

Tables 9 and 10 cover non-Communist world petroleum industry capital expenditures and exploration expenses through the end of 1966. The former distributes the total on the basis of geographic area, and the latter gives distribution by phases of the industry's activities. On a geographic basis, almost half of the total was invested in the United States in 1966, but the growth rate of petroleum investment in the United States (11 percent) was less than in Other Western Hemisphere (14 percent) and in Western Europe (17 percent). An overall growth of 10 percent in investment expenditures was indicated between 1965 and 1966, and indications are that this growth rate continued in 1967. In the distribution of petroleum investment by phase of operations, significant changes included the 6-percent decline in exploration expenses and the 2.5-percent decline in capital expenditures for production that were more than compensated by increases of over 40 percent in capital expenditures for refineries and chemical plants.

Tables 9 and 10 over non-Communist vestment in mining, smelting, and petroleum activities in foreign areas, together with earnings and income from these investments, for the most recent years for which such data are available. The growth rate of this foreign investment in mining and smelting between 1965 and 1966 was 9.2 percent, compared with 6.1 percent between 1964 and 1965; corresponding figures for petroleum were 6.3 percent between 1965 and 1966 and 6.7 percent between 1964 and 1965. On a regional basis, for mining and smelting, the most notable 1965–66 growth occurred in Australia, while in petroleum, the greatest increase was in Western Europe. During part of 1966 and through 1967, the U.S. Government had requested a voluntary limitation of direct foreign investment by U.S. firms. These controls were made mandatory on January 1, 1968.

Firm value data on expenditures within major mineral industry areas of Communist countries are not available, but statements regarding percentage increases in mineral industry investment in the U.S.S.R. indicate continuing acceleration of growth within this sector of the economy.

TRANSPORTATION

TANKERS

Expansion of the world petroleum tanker fleet continued in 1967 at a pace faster than that of the total world merchant vessel fleet. Both the number of vessels and the aggregate deadweight tonnage grew, but complete returns were not available to indicate the total amount of growth. The Near East Crisis of June and the attendant Suez Canal closure stimulated investment in supertankers.

Data on the size of the non-Communist world tanker fleet at yearend 1965 and 1966 are given in table 12; these indicate a growth in the average tanker size from 28,530 deadweight tons to 30,863 deadweight tons, reflecting the additions of larger tankers. United Nations data, on a fiscal (July 1 to June

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30) year and in terms of gross registered tons (grt) rather than deadweight tons indicate a growth of the world tanker fleet from 55,046,000 grt in mid-1965 to 60,200,000 grt in mid–1966 (including 2,484,000 grt of Soviet-flag vessels), but do not indicate the number of vessels included in these tonnages. Further expansion of the carrying capacity is assured in view of the number of supertankers launched subsequent to the compilation of the foregoing data as well as the number of such tankers now on the way or planned.

The United Nations figures indicate that in mid-1966, almost 35.2 percent of total merchant fleet gross, registered tonnage was in tankers, compared with 34.3 percent in 1965, 33 percent in 1964, and 32.3 percent in 1963.

In addition to construction of large oil tankers, mineral transporters were arranging for more liquefied natural gas carriers, as this technique for energy movement has proved economically feasible.

ORE CARRIERS

Although statistics comparable to those on tankers are not readily available on the world's ore carrier fleet, it can be stated in general terms that the trend here also is toward increasing construction and use of significantly larger vessels, again owing to the reduction in transport charges that can be effected through their use. Reflecting this trend, a number of mineral shipping and receiving ports throughout the world were undergoing enlargement and/or deepening during 1967.

OCEAN FREIGHT RATES

Table 13, which presents United Nations indexes of selected ocean freight rates, shows that except for Netherlands general cargo rates (which were unreported for the last two quarters of 1967), the London tanker brokers panel and United Kingdom ore trade, all rates advanced in 1967, led by tanker rates for Norway and West Germany.

PANAMA AND SUEZ CANALS

The world's two major international seaway canals continued to play a growing role in mineral commodity transport, despite the expanded use of oil and ore carriers that are too large to use either. Closure of Suez in June 1967 had a pronounced effect on oil transport charges during the latter half of the year. Shipment through Panama continued to increase and mineral commodities accounted for an increasing share of total goods transiting the Canal.

Of the total quantity selected major commodities [5] moving through the Panama Canal in fiscal 1967, almost 73.7 percent on a weight basis was mineral commodities, compared with the following percentages for past fiscal years: 1966—71.8; 1965—71.9; 1964—71.0; and 1963—70.3. Total materials transiting the Canal in 1967 aggregated 65,882,000 metric tons, of which mineral commodities constituted 48,546,000 tons. Of this mineral commodity total, 35 percent was petroleum as shown in table 14, which summarizes mineral commodities transiting the Canal for the fiscal years 1963–67.

For the Suez Canal, mineral commodity movement data are not available subsequent to the first 3 quarters of 1965. In those 9 months, however, oil tankers accounted for about 74 percent of total tonnage transiting the Suez Canal. In this period, 7,280 such vessels passed through the Canal out of a total of 15,207 ships. Of the oil moved, 115 million tons was northbound and 5.6 million tons southbound. Other minerals passing through the Canal northbound in the 9-month period included iron ore (2.5 million metric tons); manganese ore (854,000 tons); ilmenite and rutile (348,000 tons); lead (340,000 tons); zinc (247,000 tons); chromite (214,000 tons); tin (168,000 long tons); copper (140,000 tons); bauxite (82,000 tons); and others (246,000 tons).

Returns on total Suez Canal trade for the last quarter of 1965 and preliminary data for 1966 indicate an increase in overall traffic from 20,309 vessels in 1965 to an estimated 21,000 in 1966, and presumably there was a corresponding increase in tonnage of material moved, including petroleum and other minerals.

Following the closure of the Suez Canal, Capetown South Africa showed a marked growth in transit shipping, vessels diverted

[5] Commodities listed in Panama Canal-Selected Commodity Movements, prepared by Executive Planning Staff, March 1, 1968.

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from the Suez route. In the first year following the closure, 1,698 diverted vessels passed through Capetown, and on a tonnage basis this represented about 35 percent of the 88.2 million tons moving through the port. This diverted shipping added an estimated $980,000 to Capetown port revenues.

PIPELINES

World pipeline construction advanced in 1967 as existing means of transport for oil proved increasingly unsatisfactory or inadequate. In efforts to permit greater exports of crude oil into the Communist countries of Eastern Europe, as well as non-Communist Europe, the Soviet Union was engaged in laying a second, parallel line to the "Friendship" pipeline, as well as in expanding their internal trunk pipeline system and building a major line to move gas from Iran to the Transcaucasus. The Soviet Union's first major international gas pipeline, to move gas from Afghanistan into the U.S.S.R., was put into operation during 1967.

In non-Communist Europe, despite difficulties in acquiring rights-of-way and the rigid safety demands established, construction of lines to transport indigenous natural gas, as well as to transport imported petroleum and natural gas, proceeded through 1967 and additional extensive projects were in planning stages.

PRICES

World steel prices moved upward slightly in 1967, but in general the increases were modest relative to some of the changes in some other metals. The price differential between steel in the United States and most of the other major world producers remained virtually the same and continued to make the U.S. market a lucrative target particularly for Japanese and European producers.

Major nonferrous metal prices for 1963–67 with 1967 data on a monthly basis are presented for the United States, United Kingdom, and Canadian markets in tables 15, 16, and 17. Lead and zinc had lower average prices for 1967 than for 1966 in these markets as well as in Australia, although the price trends for the metals on a monthly basis through 1968 varied from market to market. The annual average tin price, recorded only for the U.S. and London markets, also was lower for 1967 than for 1966. The aluminum price, which advanced during January in the United States and Canada, increased on the London market in November, but this increase merely compensated for the devaluation of the pound. The United States Atlantic seaboard copper price was suspended after August when it stood at 39.090 cents; the Canadian price, which in January 1967 was already more than 8 cents higher than the U.S. price, continued to advance through December, averaging 51 Canadian cents per pound in that month. In contrast, the 1967 annual average copper price on the London market was below that for 1966, although on a monthly basis, there was a steady upturn toward the end of the year following a slump in midyear.

Market prices for silver in 1967 almost without exception increased markedly from April through December, with a slight break in their rise between July and September, raising the 1967 annual average to a new high.

Tables 18 and 19 provide data on the level of United Nations export price indexes for mineral commodities. In 1967, these were either on a par with or fell below 1966 levels on an annual basis, although there was a general rising trend after the second quarter. On a commodity basis, mineral fuels showed much less of a slump than did nonfuels. Comparing developed areas with less developed areas, the former showed a greater decline for total mineral exports than did the latter; however, considering only nonferrous base metals, the export price index fell more in the less developed countries.

RESERVES AND RESOURCES

Although an overall appraisal of the 1967 status of world mineral commodity reserves and resources is impossible within the space alloted, certain trends and specific developments seem worthy of brief mention. These will have an effect

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upon global mineral supply patterns, in regard to geographic distribution of output and consumption and therefore upon mineral commodity movement. They may also influence the quantity and unit quantity prices of available materials and the substitution of one commodity for another.

Additional discoveries and economically successful development of rather inacessible but high-grade iron ore deposits, particularly in Africa, coupled with technologic advances in ore processing (concentration, sintering and pelletizing) have added appreciably to world iron reserves. In the face of this competition, certain lower grade iron deposits in non-Communist Europe have become uneconomic as mining costs there have risen. Thus, at least some of the ferrous materials in this area, heretofore classified as economic reserves, in effect have slipped into the category of a resource, following the trend of many coal deposits in the same area.

Under slightly different circumstances, Australian iron deposits, heretofore too far from major markets, have come into their own as a major source for the rapidly expanding Japanese steel industry, and as a result exploration efforts in recent years have been extensive and quite successful.

Preliminary studies by the Argentine Government, assisted by the United Nations, indicate sizable potentially commercial porphyry copper deposits in the High Andes of Argentina but much work in the way of detailed drilling and other investigations remains necessary to assure their economic potential. Across the Atlantic, mining circles in Salisbury, Southern Rhodesia, expressed considerable interest in possibly commercial discoveries of copper-nickel mineralization in the border area between Southern Rhodesia and Botswana. This find reportedly might represent a southerly extension of the prolific copper-producing mineralization that extends through the Katanga area of the Republic of the Congo (Kinshasa) into Zambia.

Of possible significance to the economic producibility of a number of world copper, lead, zinc, and other nonferrous base metals resources has been the sharp rise in the world silver price. Particularly in the case of lead and zinc, where a number of deposits have been regarded as marginal or subeconomic in recent years, the presence of silver as a byproduct has resulted in their reconsideration for development. This trend may be expected so long as higher silver prices prevail.

Among significant recent additions to world-fertilizer raw material reserves should be counted the extensive potash discoveries of the early 1960's in Canada, that have fostered the development of a 2.2 million-ton-per-year industry within 6 years, and more recent discoveries in the Soviet Union, which, reportedly totaling 50 billion tons of minerals, rank that country's reserves as the world's largest.

Not nearly so important on a quantitative basis, but of considerable local significance, were phosphate rock discoveries of 1967 in Australia. Through 1965 at least, phosphate rock imports into Australia ranked second only to oil in terms of value, among all mineral commodity imports. Moreover, most of these imports were being obtained from the phosphate islands of the Indian and Pacific Oceans, with reserves which, almost assuredly, will be exhausted by the year 2000. Also, New Zealand, without any significant phosphate resources, draws heavily upon these islands, and prior to 1967, upon Makatea Island, where reserves were exhausted in that year. Thus, in an area with a significant and growing consumption of phosphatic raw material and faced with depletion of reserves in traditional import source areas, discovery of sizable phosphate deposits was important.

On the negative side of the ledger regarding phosphates, some concern has been shown regarding the rapid and extensive urbanization of rural Florida in the United States. Increasing value of land for purposes other than phosphate mining may force increases in production costs or abandonment of phosphate areas as too expensive for economic development.

On the Arabian Peninsula and in the offshore areas of the Persian Gulf, sizable new petroleum reserves continued to be discovered, or at last openly reported.

Several areas that had no commercial production 10 years ago have become sizable producers on the basis of these discoveries, and further expansion seems assured. States recently joining the producers ranks include Abu Dhabi (first commercial production in 1961; output in 1967 totaled 139.5 million barrels), and Muscat and Oman (first commercial production, 23 million barrels, in 1967). A

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number of offshore areas of traditional major producers—Iran, Kuwait, and Saudi Arabia—have begun operations or sizably increased output during the past 10 years.

Australia's recent (including 1967) finds of commercially exploitable petroleum have been important. Athough discoveries to date only provide a basis for production at a level much below current needs, any such discovery and ultimate development contributes to a lessening of foreign exchange expanditures for an essential mineral commodity and has provided a stimulus for further searches not only in Australia but on and offshore from nearby islands such as New Guinea.

Not yet a major factor in world energy reserves, but certainly a huge resource is the natural gas potential of the oil-producing countries of the Near East and North Africa. The highly newsworthy beginnings of liquified natural gas shipments from North Africa and Nigeria to Europe are insignificant compared to the potential that exists for utilization of a vast energy source which to date has only been crudely approximated in estimates of its size, owing to the fact that it has just recently been shown to be of possible commercial value. The gas resources of Afghanistan were tapped in 1967 by the U.S.S.R. by a major pipeline and work continued on another major international gasline from Iran to the U.S.S.R. The demonstration of economically feasible utilization of these gas resources both through pipeline shipment and liquifaction and subsequent sea shipment, coupled with growing use of gas in these areas as chemical plant fuel and feedstock suggests that more detailed study of the extent of known deposits and exploration for additional deposits may soon be in order.

Tar sands and oil shale, long regarded as vast resource of petroleum, but heretofore not proven to be economically exploitable, seemed assured of reclassification as economic reserves. In Alberta, Canada, the Athabasca tar sands were commercially tapped in September of 1967 by a $235 million, 45,000 barrel-per-day project, while in Colorado, work commenced on oil shale mining with commercial oil production from the shale slated to begin in 1970.

POLICIES AND PROGRAMS AFFECTING MINERAL PRODUCTION AND TRADE

The policies of EEC and EFTA countries toward maximizing trade between their respective members and associated nations and minimizing trade with unassociated, nonmember states were evident in changes in the distribution patterns of trade in major mineral commodities through 1966, and, although complete 1967 trade data are not available, partial information indicates that the trend continued in 1967. Considering exports from these areas, EEC shipments of major mineral commodities to member countries rose slightly more than 10 percent between 1965 and 1966, while exports to nonmember states (including associate members) increased less than 3 percent. Corresponding figures for EFTA were exports to member states up 11 percent and exports to nonmember states up 9 percent.

In the case of imports, however, the EEC's expanding requirements for fuels and other crude minerals were such that member states could not provide sufficient materials, and imports from nonmember states (including associate members) advanced 13 percent while those from member states were up only 10 percent. Among the EFTA countries, major mineral commodity imports from other member states, up 11 percent, advanced more rapidly than imports from nonmembers (up 8 percent).

The Third International Tin Agreement of the International Tin Council officially came into force on March 21, 1967. Under this agreement, the member states[6] essentially were continuing efforts toward industry stabilization that were begun with the First International Tin Agreement (July 1, 1956 to June 30, 1961) and continued under the Second Agreement (July 1, 1961 to June 30, 1966) and provisionally under the draft of the Third Agreement (July 1, 1966 to March 21, 1967).

[6] Australia, Austria, Belgium, Bolivia, Canada, Czechoslovakia, Republic of the Congo (Kinshasa), Denmark, France, India, Indonesia Israel, Italy, Japan, South Korea, Malaysia, Mexico, Netherlands, Nigeria, Spain, Thailand, Turkey, and the United Kingdom.

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Specifically, the stated objectives were to (1) provide for adjustment between tin output and consumption; (2) prevent excessive price fluctuations; (3) make arrangements to maintain or increase export earnings of developing countries from tin while also taking into account the interests of consumers (chiefly in developed countries); (4) insure conditions that would permit a rising rate of output to assure adequate tin supplies with concomitant remunerative return to producers and fair prices to consumes; (5) prevent widespead unemployment in the industry; (6) take steps to insure output increases and equitable distribution of tin in the event of shortages of supply; (7) take steps to mitigate difficulties that might arise in producing countries as a result of oversupply; (8) review disposals from government stockpiles of tin and formulate criteria applicable to such disposals that would eliminate problems that might arise; (9) to arrange for continuing studies of short- and long-term industry problems; (10) to review the need for developing new deposits and protecting existing deposits against waste or premature abandonment; and (11) encourage wider participation in organizations devoted to research to promote tin consumption.[7] Buffer stock arrangements set up under the earlier agreements were continued as the principal method of providing supply and price stability. At the sixth meeting under the Third Agreement (November 21–22, 1967), the buffer stocks floor price was set at £1,283 per long ton and the ceiling price at £1,633 per long ton. Floor and ceiling buffer stock prices were slated for review in mid–January of 1968.

Within the United States, the Government took steps to insulate the U.S. market from the sharp increases in the world price of copper. Moves included a special purchase of copper from Chile undertaken as a part of a larger financial arrangement and releases of copper from Governmental stockpiles. Efforts were also made within the United States to assure that the available copper moved into the hands of essential consumers.

Tariff negotiations under GATT, generally known as the Kennedy Round, were concluded in 1967. The first reductions under the Kennedy Round as of January 1, 1968. While many of the tariff reductions are in manufactured items, iron and steel mill products and some major nonferrous metals are involved as well.

STATISTICAL SUMMARY OF WORLD PRODUCTION AND TRADE OF MAJOR COMMODITIES

The final 27 tables in this chapter (tables 20 through 46) extend the statistical series started in the 1963 edition and updated in the 1965 edition. They are provided both as a supplement to other statistical data within the chapter and as a summary of international production and trade data for major commodities covered in greater detail on a commodity basis in individual chapters of volume I and II of the Minerals Yearbook and on a regional basis in country chapters of volume IV. The data presented here on production (tables 20 through 36) include all revisions in reported data and in estimates that were available to the authors through September 30, 1968, and therefore should be considered more reliable and up-to-date than foreign production data prepared previous to this date and published elsewhere in the 1967 Minerals Yearbook changes in world totals in these tables relative to data published in previous editions of the Minerals Yearbook are (1) the result of acquisition of new data and (2) due to fact that totals no longer contain estimates for countries not reported individually, but rather represent only a summation of recorded figures, both reported and estimated. National gas output is included for the first time owing to this fuel's rising importance as an energy source.

Overall world movements of 9 major mineral commodities are presented in tables 37 to 46; 8 of these have been covered in similar tables in previous editions of Volume IV. Petroleum product trade, not heretofore reported in this chapter, is included for the first time (table 46).

[7] International Tin Council. Statistical Bulletin. April, 1968, 72 pp.

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Table 1.—United Nations indexes of world [1] mineral industry production

(1963=100)

Industry sector and geographic area	1964	1965	1966	1967	1967 by quarters			
					1st	2d	3d	4th
Extractive industries:								
Metals:								
Non-Communist world	105	110	114	113	110	119	113	112
Industrialized countries [2]	105	109	114	112	110	121	111	105
United States and Canada	106	111	117	112	112	127	110	97
Europe	106	108	106	107	101	109	100	116
European Economic Community only [3]	101	100	97	92	92	86	90	98
Less industrialized countries [4]	105	112	113	116	108	115	116	125
Latin America [5]	105	110	116	120	117	115	113	133
Asia, East and Southeast [6]	103	112	113	117	112	121	120	116
Communist Europe [7]	109	121	133	146	144	146	148	146
World [8]	106	113	118	121	118	125	121	120
Coal:								
Non-Communist world	101	100	97	93	96	95	87	96
Industrialized countries [2]	102	100	96	92	95	93	85	95
United States and Canada	106	111	114	115	114	117	111	116
Europe	100	96	90	84	88	85	75	88
European Economic Community only [3]	101	97	90	81	87	81	75	83
Less industrialized countries [4]	99	103	106	106	108	108	103	104
Latin America [5]	106	97	106	NA	NA	NA	NA	NA
Asia, East and Southeast [6]	97	104	106	106	111	109	104	102
Communist Europe [7]	103	106	108	109	110	108	108	110
World [8]	102	103	101	100	102	100	95	102
Crude petroleum and natural gas:								
Non-Communist world	105	110	118	124	125	119	126	127
Industrialized countries [2]	103	105	111	116	115	112	119	118
United States and Canada	102	105	111	116	115	112	119	118
Europe	110	120	127	136	126	135	136	146
European Economic Community only [3]	109	113	115	118	118	118	115	121
Less industrialized countries [4]	108	117	128	135	137	129	135	139
Latin America [5]	105	106	105	111	107	107	116	113
Asia, East and Southeast [6]	110	120	130	153	151	145	156	159
Communist Europe [7]	111	123	136	150	149	151	150	149
World [8]	106	113	122	130	130	126	131	132
Total extractive industry:								
Non-Communist world	105	109	113	116	115	115	116	119
Industrialized countries [2]	107	114	122	125	123	126	121	130
United States and Canada	104	107	113	116	114	116	119	116
Europe	104	103	101	99	99	101	93	104
European Economic Community only [3]	106	110	115	116	114	117	109	125
Less industrialized countries [4]	107	115	123	129	129	125	128	133
Latin America [5]	105	107	108	113	110	109	115	118
Asia, East and Southeast [6]	108	116	123	129	129	127	129	132
Communist Europe [7]	108	116	124	132	133	133	133	132
World [8]	106	111	117	121	121	121	121	123
Processing industries:								
Base metals:								
Non-Communist world	114	120	124	125	125	126	119	129
Industrialized countries [2]	114	120	124	124	124	125	118	127
United States and Canada	114	121	126	118	121	119	111	120
Europe	112	118	117	119	119	121	112	124
European Economic Community only [3]	111	116	115	117	116	119	113	122
Less industrialized countries [4]	111	117	131	136	134	135	134	141
Latin America [5]	113	116	128	131	NA	NA	NA	NA
Asia, East and Southeast [6]	100	103	109	110	115	107	109	110
Communist Europe [7]	108	117	126	136	137	136	136	136
World [8]	112	119	125	128	128	129	124	131
Nonmetallic mineral products:								
Non-Communist world	111	115	121	123	110	126	128	127
Industrialized countries [2]	110	115	119	121	108	124	126	125
United States and Canada	107	114	120	118	107	119	125	121
Europe	113	115	119	121	106	128	126	125
European Economic Community only [3]	112	112	114	117	98	123	124	121
Less industrialized countries [4]	112	119	130	138	127	141	141	144
Latin America [5]	111	115	124	133	120	133	137	140
Asia, East and Southeast [6]	107	120	124	135	127	138	134	142
Communist Europe [7]	110	120	131	141	142	141	141	141
World [8]	110	117	125	130	123	132	134	133

See footnotes at end of table.

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Table 1.—United Nations indexes of world [1] mineral industry production—Continued

(1963=100)

Industry sector and geographic area	1964	1965	1966	1967	1967 by quarters			
					1st	2d	3d	4th
Processing industries—Continued								
Chemicals, petroleum and coal products:								
Non-Communist world	109	118	130	138	135	138	136	144
Industrialized countries [2]	110	119	131	140	136	139	138	146
United States and Canada	107	115	127	133	130	133	133	137
Europe	113	123	135	145	143	145	139	153
European Economic Community only [3]	114	125	139	150	147	149	146	160
Less industrialized countries [4]	108	115	123	130	126	131	128	134
Latin America [5]	107	114	121	126	NA	NA	NA	NA
Asia, East and Southeast [6]	109	114	121	128	125	125	125	135
Communist Europe [7]	113	128	144	161	157	162	161	165
World [8]	110	120	133	143	140	143	141	148

[1] Excludes a number of countries of the Near East and Africa as well as mainland China, North Korea, and North Viet-Nam.
[2] All countries having a per-capita value added in manufacturing in 1958 equivalent to US$125 or more.
[3] Belgium, France, West Germany, Italy, Luxembourg, and the Netherlands.
[4] Countries having a per-capita value added in manufacturing in 1958 of less than US$125.
[5] Central and South America and the Caribbean Islands.
[6] Afghanistan, Brunei, Burma, Ceylon, Hong Kong, India, Indonesia, Iran, South Korea, Malaysia (excluding Sabah), Mongolia. Pakistan, Philippines, Singapore, Taiwan, Thailand, and South Viet-Nam.
[7] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, U.S.S.R., and Yugoslavia.
[8] Aggregate for listed countries.
Source: United Nations Monthly Bulletin of Statistics. August, 1968, pp x–xxi.

Table 2.—World production of major minerals

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Aluminum—thousand metric tons	5,323	5,912	6,288	6,860	7,451
Antimony—do	57	63	62	61	58
Arsenic, white [1 2]—do	48	53	49	48	55
Bauxite—do	30,707	33,389	37,530	39,948	44,608
Beryl—metric tons	6,600	[2] 4,500	[2] 5,200	[2] 3,200	[2] 8,600
Bismuth [1 3]—do	2,500	2,910	3,000	3,110	3,330
Cadmium [4]—do	12,093	13,008	11,917	13,115	12,409
Chromite—thousand metric tons	3,822	4,137	4,760	5,020	5,094
Cobalt [5]—metric tons	15,200	16,600	17,800	20,800	19,100
Columbium-tantalum [6]—do	4,467	5,318	6,631	10,415	9,458
Copper:					
Mine [7]—thousand metric tons	4,618	4,801	5,024	5,259	4,986
Smelter—do	4,942	5,236	5,520	5,718	5,394
Gold [8]—thousand troy ounces	43,147	44,840	46,222	46,567	45,614
Iron and steel:					
Iron ore—thousand metric tons	523,442	581,303	617,304	639,426	629,297
Pig iron (including ferroalloys) [9] thousand metric tons	281,518	317,561	335,129	347,046	355,556
Steel ingots (including castings) thousand metric tons	386,979	438,006	459,300	476,059	492,929
Lead:					
Mine—do	2,518	2,531	2,702	2,855	2,914
Smelter—do	2,449	2,526	2,614	2,720	2,769
Magnesium—do	143	151	162	162	183
Manganese ore—do	14,723	15,847	17,632	17,169	17,073
Mercury—thousand 76-pound flasks	240	255	268	265	242
Molybdenum [10]—metric tons	41,250	42,800	52,400	64,650	64,750
Nickel [11]—thousand metric tons	341	373	423	398	439
Platinum-group metals thousand troy ounces	2,040	2,545	2,970	3,070	3,180
Selenium [6]—metric tons	915	980	816	907	963
Silver [12]—thousand troy ounces	249,982	248,551	256,362	268,564	260,915
Tellurium [6]—metric tons	145	128	145	151	127
Tin:					
Mine—long tons	[1] 191,100	[1] 193,600	201,300	210,800	[1] 216,100
Smelter—do	195,100	190,100	195,400	203,700	219,100
Titanium concentrates: [6]					
Ilmenite—thousand metric tons	1,987	2,349	2,466	2,631	2,710
Rutile—do	201	195	[1] 223	[1] 253	[1] 282
Tungsten concentrate (contained tungsten) [13]—metric tons	27,100	28,100	27,300	28,600	28,100
Uranium oxide (U_3O_8) [6 14]—do	28,200	24,300	19,200	17,300	16,900
Vanadium [6]—do	7,183	7,776	8,921	9,095	9,644
Zinc:					
Mine [15]—thousand metric tons	3,666	4,025	4,309	4,488	4,916
Smelter [15]—do	3,441	3,696	3,897	4,096	4,129

See footnotes at end of table.

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Table 2.—World production of major minerals—Continued

Commodity	1963	1964	1965	1966	1967 p
Nonmetals:					
Asbestos [16]--thousand metric tons--	2,506	2,770	2,817	2,976	2,992
Barite [4]----------do----	3,000	3,234	3,563	3,742	3,508
Cement, hydraulic----------do----	378,135	415,686	435,582	464,445	447,909
Diamond:					
Gem--thousand metric carats--	6,424	7,647	7,707	8,909	9,093
Industrial----------do----	30,242	30,167	29,323	31,046	33,295
Diatomite [17]-thousand metric tons--	1,376	1,406	1,439	1,558	1,564
Feldspar [18]----------do----	1,715	1,862	1,955	2,012	1,987
Fluorspar [19]----------do----	2,148	2,466	2,773	2,858	3,192
Graphite----------do----	694	635	622	499	378
Gypsum [20]----------do----	45,504	46,938	48,154	48,336	46,626
Magnesite [21]----------do----	8,982	[1] 9,541	10,085	[1] 10,071	[1] 10,057
Mica [6]----------do----	144	146	r 158	147	140
Phosphate rock [22]----------do----	48,741	57,050	r 63,860	75,793	78,703
Potash (marketable), K_2O equivalent thousand metric tons--	11,300	12,300	13,700	14,600	15,400
Pumice [6 23]----------do----	15,121	14,725	14,515	14,677	13,813
Pyrites (including cupreous)-do----	19,800	20,600	21,540	21,920	22,410
Salt----------do----	96,110	99,160	108,126	111,394	118,262
Strontium minerals [6]--metric tons--	17,019	23,523	14,011	16,898	14,293
Sulfur:					
Native, including frasch [24] thousand metric tons--	8,264	8,833	9,736	10,887	11,150
Byproduct elemental----do----	4,611	5,307	5,794	5,823	6,285
Talc, soapstone and pyrophyllite thousand metric tons--	3,094	3,518	3,575	3,713	4,013
Vermiculite [6]----------do----	298	311	344	346	336
Mineral fuels:					
Coal:					
Anthracite----------do----	182,479	190,461	193,443	194,726	186,765
Bituminous----------do----	1,755,837	1,816,656	1,866,436	1,900,467	1,805,860
Lignite----------do----	711,178	742,013	737,316	732,649	728,896
Total----------do----	2,649,494	2,749,130	2,797,195	2,827,842	2,721,521
Coke:					
Metallurgical----------do----	281,790	299,042	310,151	309,776	304,978
Other types [25]----------do----	39,063	37,506	34,876	33,360	31,816
Fuel briquets [26]----------do----	121,400	120,950	115,100	111,950	110,000
Gas, natural (marketed) [27] million cubic feet--	21,165,883	23,076,733	24,697,707	26,612,164	28,611,206
Peat [28]----thousand metric tons--	165,600	177,000	183,100	203,100	203,100
Petroleum, crude-thousand barrels--	9,538,948	10,311,060	11,057,489	12,015,830	12,889,705

p Preliminary.
[1] United States data withheld to avoid disclosing individual company confidential data.
[2] Excludes Argentina, Austria, Belgium, mainland China, Czechoslovakia, East Germany, Finland, Hungary, United Kingdom, and Yugoslavia.
[3] Excludes Brazil, Bulgaria, East Germany and North Korea.
[4] Excludes Bulgaria.
[5] Excludes Bulgaria, East Germany, Poland and Uganda.
[6] Excludes production, if any, by Albania, Bulgaria, mainland China, Czechoslovakia, East Germany, Hungary, North Korea, Mongolia, Poland, Rumania, U.S.S.R., and North Viet-Nam.
[7] Excludes Czechoslovakia, Hungary, Iran, Kenya and Malaya.
[8] Excludes Bulgaria, Czechoslovakia, Rumania and a negligible amount in East Germany, Hungary and Thailand.
[9] Excludes a negligible amount produced in the Republic of the Congo (Kinshasa).
[10] Excludes a negligible amount produced in Bulgaria, North Korea, Rumania, South-West Africa and Spain.
[11] Excludes Albania and East Germany.
[12] Excludes a negligible amount produced in Bulgaria, Mozambique, Panama, Thailand and Turkey.
[13] Excludes India, Italy, Hong Kong, Malaysia, New Zealand, Nigeria, Republic of South Africa, and Southern Rhodesia.
[14] Excludes West Germany, India, Italy and Japan.
[15] Excludes Czechoslovakia, Rumania and North Viet-Nam.
[16] Excludes a negligible amount produced in Czechoslovakia, Ethiopia, Malagasy, North Korea and Rumania.
[17] Excludes Bulgaria, Hungary, Japan, Rumania, and United Arab Republic.
[18] Excludes Brazil, mainland China, Czechoslovakia and Rumania.
[19] Excludes Brazil, Bulgaria and Burma.
[20] Excludes Bolivia, Ecuador, Rumania and Switzerland.
[21] Excludes Bulgaria and Canada.
[22] Excludes a negligible amount of phosphate rock produced in Cambodia, Jamaica, the Philippines and Tanzania and of guano in Argentina, South-West Africa and the Philippines.
[23] Excludes Japan and Mexico.
[24] Excludes Iran.
[25] Excludes Ceylon, mainland China, Malaysia, Mexico, Rumania and U.S.S.R.
[26] Excludes Indonesia and Pakistan.
[27] Excludes mainland China.
[28] Excludes a negligible amount of fuel peat produced in Canada, Iceland, Italy and Spain.

Note: This table incorporates numerous revisions from world production tables and country production tables appearing in Volumes I–II and IV, respectively of the Minerals Yearbook. Data in this table revised through September 30, 1968.

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Table 3.—Approximate percentage distribution of world mineral production by major areas in 1967 [1]

Commodity	Western Hemisphere			Eastern Hemisphere							World	
				Europe			Near East and Asia					
	North and Central America	South America	Total	Non-Communist [2]	Communist [3]	Africa	Non-Communist [4]	Communist [5]	Oceania	Total	Non-Communist	Communist [6]
Metals:												
Aluminum:												
Bauxite	27.8	20.1	47.9	15.4	15.4	5.2	5.8	0.8	9.5	52.1	83.8	16.2
Ingot	51.8	.9	52.7	20.8	17.3	.6	6.3	1.1	1.2	47.3	81.6	18.4
Antimony	8.8	20.5	29.3	5.6	14.4	24.3	4.1	20.7	1.6	70.7	64.9	35.1
Arsenic, white	28.7	.9	29.6	56.4	12.8	NA	1.2	NA	------	70.4	87.2	12.8
Beryl	W	W	18.7	.4	14.0	9.3	57.1	------	.5	81.3	86.0	14.0
Bismuth	W	W	W	6.3	1.2	.1	23.4	7.5	------	38.5	91.3	8.7
Cadmium	39.3	1.2	40.5	14.3	21.3	4.4	15.3	------	4.2	59.5	78.7	21.3
Chromite	.6	.1	.7	2.5	37.6	30.9	27.7	.6	(7)	99.3	61.2	38.8
Cobalt	W	------	W	W	7.3	68.6	------	------	.5	W	87.2	12.8
Columbium-tantalum [8]	20.4	52.2	72.6	.7	NA	25.1	1.4	------	.2	[8] 27.4	100.0	NA
Copper:												
Mine	29.9	17.1	47.0	2.8	17.4	23.8	5.4	1.8	1.8	53.0	80.7	19.3
Smelter	23.9	14.6	38.5	11.2	16.6	20.9	9.5	1.9	1.4	61.5	81.5	18.5
Gold	10.8	1.4	12.2	.6	12.5	70.4	2.1	.5	1.7	87.8	87.0	13.0
Iron and steel:												
Iron ore	20.7	9.5	30.2	19.3	28.9	6.0	7.0	5.5	3.0	69.8	65.6	34.4
Pig iron (including ferroalloys)	25.1	1.4	26.5	26.0	26.8	1.2	18.7	4.4	1.4	73.5	68.8	31.2
Steel ingots and castings	25.8	1.3	27.1	26.7	27.4	.7	14.3	2.5	1.3	72.9	70.1	29.9
Lead:												
Mine	26.8	8.0	34.8	15.3	21.0	6.5	4.1	5.3	13.0	65.2	73.7	26.3
Smelter	24.5	4.4	28.9	22.5	22.2	4.5	6.1	5.3	10.5	71.1	72.5	27.5
Magnesium	52.6	------	52.6	21.6	21.8	------	3.5	.5	------	47.4	77.7	22.3
Manganese ore	1.2	7.9	9.1	.4	44.5	25.0	13.3	4.1	3.6	90.9	51.0	49.0
Mercury	19.7	1.3	21.0	47.1	19.1	.1	4.4	8.3	------	79.0	72.6	27.4
Molybdenum	76.7	8.9	85.6	.4	10.8	NA	.9	2.3	------	14.4	86.9	13.1
Nickel	60.2	.2	60.4	.7	22.0	1.5	1.4	------	14.0	39.6	71.9	28.1
Platinum-group metals	13.2	.8	14.0	------	59.7	26.1	.2	------	------	86.0	40.3	59.7
Selenium [8]	63.6	.5	64.1	13.1	NA	2.7	19.9	------	.2	[8] 35.9	100.0	NA
Silver	42.4	17.4	59.8	7.1	16.4	3.3	5.3	.5	7.6	40.2	83.1	16.9
Tellurium [8]	77.6	11.7	89.3	------	NA	------	6.7	------	------	[8] 10.7	100.0	NA
Tin:												
Mine	.4	13.7	14.1	1.3	12.2	9.7	50.9	9.3	2.5	85.9	78.5	21.5
Smelter	1.8	1.5	3.3	21.4	11.9	5.6	47.1	9.1	1.6	96.7	79.0	21.0
Titanium:												
Ilmenite [8]	51.5	.5	52.0	20.8	NA	.1	[8] 6.9	------	20.2	[8] 48.0	100.0	NA
Rutile [8]	NA	(7)	(7)	------	NA	(7)	.9	------	99.1	[8] 100.0	100.0	NA
Tungsten	13.9	7.9	21.8	4.6	22.0	1.7	10.5	36.0	3.4	78.2	42.0	58.0
Uranium oxide (U_3O_8) [8]	69.3	.1	69.4	7.7	NA	21.1	NA	------	1.8	[8] 30.6	100.0	NA
Vanadium [8]	46.7	------	46.7	19.1	NA	34.2	------	------	------	[8] 53.3	100.0	NA

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Zinc:												
Mine	39.3	7.5	46.8	12.5	16.6	5.4	6.4	4.1	8.2	53.2	79.3	20.7
Smelter	31.1	2.1	33.2	22.8	20.1	2.6	12.7	3.8	4.8	66.8	76.1	23.9
Nonmetals:												
Asbestos	47.5	.1	47.6	4.4	25.7	14.5	2.4	5.0	.4	52.4	69.3	30.7
Barite	36.0	5.5	41.5	31.2	11.3	5.0	5.0	5.6	.4	58.5	83.1	16.9
Cement, hydraulic	16.9	3.6	20.5	31.5	25.4	2.7	16.5	2.4	1.0	79.5	72.0	28.0
Diamond:												
Gem	----	2.6	2.6	------	15.4	81.9	.1	------	------	97.4	84.6	15.4
Industrial	----	.8	.8	------	16.8	82.4	(7)	------	------	99.2	83.2	16.8
Diatomite	40.9	.9	41.8	33.7	23.0	1.1	.1	------	.3	58.2	77.0	23.0
Feldspar	32.0	2.2	34.2	45.2	13.5	1.5	5.4	NA	.2	65.8	86.5	13.5
Fluorspar	35.5	.5	36.0	29.0	14.4	3.1	6.4	11.1	------	64.0	74.5	25.5
Graphite	W	W	W	W	20.4	4.6	20.5	27.8	------	W	51.8	48.2
Gypsum	30.8	1.6	32.4	40.1	12.9	1.7	10.1	1.1	1.7	67.6	85.9	14.1
Magnesite	W	W	W	24.7	51.2	1.2	3.4	18.0	.2	98.7	30.8	69.2
Mica, including scrap [8]	77.2	1.4	78.6	3.4	NA	2.5	15.1	NA	.4	[8] 21.4	100.0	NA
Phosphate rock	46.0	.6	46.6	(7)	20.8	23.2	3.3	3.0	3.1	53.4	76.2	23.8
Potash, K_2O equivalent (marketable)	33.9	.1	34.0	31.2	32.3	------	2.5	------	------	66.0	67.7	32.3
Pumice [8]	22.8	1.1	23.9	76.0	NA	(7)	NA	------	.1	[8] 76.1	100.0	NA
Pyrites, including cupreous	5.5	------	5.5	31.5	21.2	4.8	26.9	8.9	1.2	94.5	69.8	30.2
Salt	37.8	2.6	40.4	23.2	13.9	2.1	8.2	11.6	.6	59.6	74.4	25.6
Strontium minerals [8]	17.8	2.8	20.6	74.6	NA	------	4.8	------	------	[8] 79.4	100.0	NA
Sulfur:												
Native	80.4	1.5	81.9	.7	13.7	.1	2.5	1.1	------	18.1	85.2	14.8
By-product, elemental	55.3	.1	55.4	31.3	9.5	.3	1.4	2.1	------	44.6	88.4	11.6
Talc and soapstone	24.0	2.6	26.6	15.7	12.9	1.3	37.6	5.5	.4	73.4	81.6	18.4
Vermiculite [8]	68.8	.8	69.6	------	NA	30.3	.1	------	------	[8] 30.4	100.0	NA
Mineral fuels:												
Coal, all grades including lignite	19.3	.4	19.7	19.0	42.4	1.9	5.5	9.2	2.3	80.3	48.4	51.6
Coke:												
Metallurgical	20.8	.7	21.5	28.2	32.3	1.2	10.7	4.9	1.2	78.5	62.8	37.2
Other types	.5	.9	1.4	36.5	36.2	.8	22.5	NA	2.6	98.6	63.8	36.2
Fuel briquets	.1	------	.1	21.4	66.9	(7)	9.9	------	1.7	99.9	33.1	66.9
Gas, natural (marketed)	69.8	2.1	71.9	3.7	22.7	.3	1.4	--------	(7)	28.1	77.3	22.7
Peat	.4	(7)	.4	3.4	96.0	------	.2	------	------	99.6	4.0	96.0
Petroleum, crude	29.2	12.2	41.4	1.2	17.4	8.7	30.6	.6	.1	58.6	82.0	18.0

NA Production data not available, no estimate for output included in total upon which percentages have been calculated. W Withheld to avoid disclosing individual U.S. company confidential data.

[1] See detailed Footnotes on table 2 of this chapter indicating countries excluded from world totals for each of the commodities listed. Data presented in this table have been calculated from production figures that include additions and revisions to all data appearing elsewhere in the 1967 Minerals Yearbook. These production data were compiled September 30, 1968.

[3] Includes all European countries not listed in Footnote 3; note that Yugoslavia is included here with non-Communist countries.

[3] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania and U.S.S.R; note that Yugoslavia is not included.

[4] Includes all countries and other political areas in the Near East, South Asia and the Far East not listed in Footnote 5.

[5] Mainland China, Mongolia, North Korea and North Viet-Nam.

[6] Total of countries listed in Footnotes 3 and 5 plus Cuba.

[7] Less than .05 percent.

[8] Percentages calculated from total that includes no estimates for Communist countries listed in Footnotes 3 and 5.

[9] Percentage based on export date in lieu of production figures.

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Table 4.—Value of world trade in major mineral commodities [1] by region [2] and major commodity group

(Million dollars)

Area and country [3]	Mineral commodities								All commodities	
	Exports				Imports					
	Metal ores concentrates and scrap	Metals	Mineral fuels	Total	Metal ores and scrap	Metals	Mineral fuels	Total	Exports	Imports
1963 total	3,640	12,060	15,700	31,400	3,640	12,060	15,700	31,400	153,860	153,860
1964 total	4,360	14,270	17,010	35,640	4,360	14,270	17,010	35,640	172,160	172,160
1965 total	4,580	16,390	17,920	38,890	4,580	16,390	17,920	38,890	186,390	186,390
1966:										
Northern North America:										
United States	420	1,160	980	2,560	1,010	2,910	2,230	6,150	30,000	24,580
Canada	870	1,155	460	2,485	145	490	640	1,275	9,550	9,070
Total [3]	1,290	2,315	1,440	5,045	1,155	3,400	2,870	7,425	39,550	33,650
Latin America	760	921	2,700	4,381	52	785	670	1,507	11,660	10,410
Europe:										
Non-Communist:										
EEC	510	5,800	2,250	8,560	1,450	5,130	5,150	11,730	52,630	51,020
EFTA	340	2,430	540	3,310	650	2,690	2,970	6,310	27,990	30,930
Other [3]	70	300	80	450	90	840	760	1,690	5,680	9,690
Subtotal	920	8,530	2,870	12,320	2,190	8,660	8,880	19,730	86,300	91,640
Communist	455	2,130	2,300	4,885	500	1,835	1,280	3,615	20,910	19,650
Total [3]	1,375	10,660	5,170	17,205	2,690	10,495	10,160	23,345	107,210	111,290
Africa:										
Republic of South Africa	(4)	(4)	54	[5] 54	6	134	130	270	1,680	2,250
Other	395	[5] 1,080	1,980	[5] 3,405	3	434	485	922	8,380	8,150
Total [3]	[5] 395	[5] 1,080	2,034	[5] 3,459	9	568	615	1,192	10,060	10,400
Near East	(4)	(4)	5,960	[5] 5,960	1	335	375	711	7,130	5,050
South Asia and Far East:										
Japan	(4)	1,410	32	[5] 1,442	850	460	1,460	2,770	9,780	8,080
Other non-Communist	415	421	650	1,486	53	910	970	1,933	9,750	14,220
Subtotal	[5] 415	1,831	682	[5] 2,928	903	1,370	2,430	4,703	19,530	22,300
Communist	(4)	145	29	[5] 174	3	291	57	351	2,220	2,300
Total	[5] 415	1,976	711	[5] 3,102	906	1,661	2,487	5,054	21,750	24,600

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Australia and New Zealand	(4)	280	115	[5] 395	4	188	295	487	4,140	3,780
Rest of world	265		920	1,185	6	117	940	1,063	1,980	2,950
Not reported [3]	340	378		718	17	11	638	666		1,350
Grand total 1966	4,840	17,560	19,050	41,450	4,840	17,560	19,050	41,450	203,480	203,480

[1] Commodities included are as follows: SITC (Standard International Trade Classification) categories: (1) Division 28—Metal ores concentrates, and scrap; Section 3—Mineral Fuels, lubricants and related materials; Division 67—Iron and steel; Division 68—Nonferrous metals.

[2] Regional groupings generally conform to United Nations practice; modifications and special aspects of classification scheme are as follows: (1) Latin America include Mexico, Central America, and South America, but excludes Caribbean Islands; (2) EEC consists of Belgium, France, West Germany, Italy, Luxembourg, and The Netherlands; (3) EFTA consists of Austria, Denmark, Norway, Portugal, Sweden, Switzerland, and the United Kingdom; (4) Other non-Communist Europe consists of Finland, Greece, Iceland, Ireland, and Spain as well as Yugoslavia (a Communist country) and Turkey (a Near-Eastern country); (5) Communist Europe includes Albania, Bulgaria, Czechoslovakia, Hungary, Poland, Rumania, and the U.S.S.R.; (6) Other Africa corresponds to the United Nations category "Developing Africa"; (7) Near East corresponds to the United Nations category "Western Asia"; (8) Other non-Communist South Asia and Far East corresponds to the United Nations category "Other developing Asia" (9) Communist Far East consists of China (mainland), North Korea, Mongolia, and North Viet-Nam; (10) Rest of world is taken directly from source and reportedly consists mainly of Caribbean and Pacific Islands; (11) Not reported is derived by subtracting all listed figures from reported totals.

[3] Data not reported in source but derived from data therein.

[4] Not listed separately, presumably included under Not reported (see below in body of table).

[5] Partial total, exclusions indicated by footnotes 4 and 6 applied to detail.

[6] Nonferrous metals only; iron and steel presumably included under Not reported (see below in body of table).

Sources: United Nations. Monthly Bulletin of Statistics. March 1968, pp. xviii-xix and xxiv-xxv, and May 1968, pp. xxv-xxvi and xxviii-xxxiii.

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Table 5.—Direction of trade in major mineral commodities [1] in 1966

(Million dollars)

Sources	Destinations [2]									
	Northern North America			Latin America	Non-Communist Europe				Communist Europe	Near East
	United States	Canada	Total [3]		EEC	EFTA	Other [3]	Total		
Northern North America:										
United States	XX	619	619	378	573	203	70	846	6	28
Canada	1,565	XX	1,565	49	145	517	20	682	3	3
Total [3]	1,565	619	2,184	427	718	720	90	1,528	9	31
Latin America	1,622	231	1,853	343	560	509	63	1,132	45	2
Europe:										
Non-Communist:										
EEC	628	68	696	194	4,395	1,588	442	6,425	222	169
EFTA	320	72	392	72	1,065	928	257	2,250	168	67
Other [3]	34	1	35	5	180	94	21	295	75	5
Subtotal	982	139	[4] 1,121	271	5,640	2,610	720	8,970	465	241
Communist	43	8	51	158	491	417	366	1,274	2,910	46
Total [3]	1,025	147	1,172	429	6,131	3,027	1,086	10,244	3,375	287
Africa:										
Republic of South Africa [5]	1	----	1	----	3	1	1	5	----	----
Other [6]	169	30	199	28	2,020	727	108	2,855	32	5
Total [3 7]	170	30	200	28	2,023	728	109	2,860	32	5
Near East [8]	270	90	360	105	1,780	950	260	2,990	----	330
South Asia and Far East:										
Japan [9]	606	35	641	94	45	13	18	76	41	34
Other non-Communist	183	12	195	11	148	51	15	214	33	12
Subtotal [3 9]	789	47	836	105	193	64	33	290	74	46
Communist Far East [8]	----	----	----	2	18	4	1	23	51	----
Total [3 10]	----	----	----	----	----	----	----	----	----	----
Australia and New Zealand [8]	43	4	47	2	30	58	7	95	1	----
Rest of world [11]	520	110	630	61	88	159	22	269	----	3
Not reported [3]	146	----	146	5	189	91	19	299	28	7
Grand total [12]	6,150	[4] 1,275	[4] 7,425	1,507	11,730	6,310	1,690	19,730	3,615	711

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	Destinations [2]										
	Africa			South Asia and Non-Communist Far East			Communist Far East	Australia and New Zealand	Rest of world	Not reported [3]	Grand total
	Republic of South Africa	Other	Total [3]	Japan	Other	Total [3]					
Northern North America:											
United States	21	52	73	366	197	563	---	26	27	---	[4] 2,560
Canada	16	4	20	113	22	135	1	17	4	6	2,485
Total [3]	37	56	93	479	219	698	1	43	31	6	[4] 5,045
Latin America	1	4	5	210	13	223	9	3	760	6	4,381
Europe:											
Non-Communist:											
EEC	23	269	292	26	145	171	101	8	29	253	8,560
EFTA	42	68	110	34	85	119	30	63	34	5	3,310
Other [3]	---	10	10	5	17	22	---	---	---	3	450
Subtotal	[4] 64	347	[4] 411	65	247	312	131	71	63	[4] 264	12,320
Communist	---	70	70	166	90	256	93	---	---	27	4,885
Total [3]	64	417	481	231	337	568	224	71	63	291	17,205
Africa:											
Republic of South Africa [5]	XX	26	26	2	1	3	---	---	---	19	54
Other [6]	56	87	143	108	5	113	3	1	3	63	3,445
Total [3 7]	56	113	169	110	6	116	3	1	3	82	3,499
Near East [5]	92	220	312	990	395	1,385	---	185	60	233	5,960
South Asia and Far East:											
Japan [8]	8	30	38	XX	367	367	113	39	5	---	[4] 1,442
Other non-Communist	2	14	16	417	457	874	---	83	48	---	1,486
Subtotal [3 9]	10	44	54	417	824	1,241	113	122	53	---	[4] 2,928
Communist Far East [8]	---	8	8	55	36	91	NA	---	---	---	[4] 174
Total [3 10]	---	---	---	---	---	---	---	---	---	---	---
Australia and New Zealand [8]	2	2	4	94	61	155	2	62	21	6	395
Rest of world [11]	3	20	23	48	29	77	---	3	76	43	1,185
Not reported [3]	5	38	43	136	13	149	---	---	---	---	[4] 678
Grand total [12]	270	922	1,192	2,770	1,933	4,703	[4] 351	[4] 487	[4] 1,063	[4] 666	41,450

NA Not available. XX Not applicable. [1] Commodities included are detailed in footnote 1, table 4, of this chapter. [2] Regional groupings are defined in footnote 2, table 4, of this chapter. [3] Data not reported in source, but derived from data therein. [4] Detail does not add to reported total apparently because of rounding. [5] Value of mineral fuel exports only; value of (1) metal ores and scrap; (2) iron and steel; and (3) nonferrous metals presumably included under Not reported (in body of table). [6] Value of (1) mineral fuels; (2) metal ores and scrap; and (3) nonferrous metals; value of iron and steel presumably included under Not reported (in body of table). [7] Total incomplete; see footnotes 4 and 5 on Republic of South Africa and Other Africa, respectively. [8] Value of (1) mineral fuels; (2) iron and steel; and (3) nonferrous metals; value of metal ores and scrap presumably included under Not reported (in body of table). [9] Total incomplete; see footnote 8 on Japan. [10] Total incomplete; see footnote 8 on Japan and Communist Far East. [11] Value of (1) iron and steel and (2) nonferrous metals; value of (1) metal ores and scrap and (2) mineral fuels presumably included under Not reported (in body of table). [12] Total as reported in source. Sources: United Nations. Monthly Bulletin of Statistics. March 1968, pp. xxiv–xxv, and May 1968, pp. xxv–xxvi and xxviii–xxxiii.

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Table 6.—Estimated world [1] consumption of major nonferrous metals

Metal	1963	1964	1965	1966	1967
Aluminum [2] thousand metric tons	5,319	5,834	6,496	r 7,044	7,333
Copper [3] do	5,401	r 5,921	r 6,121	r 6,442	6,072
Lead [4] do	2,658	2,783	2,794	r 2,946	3,029
Tin [5] thousand long tons	162	r 168	r 165	r 166	166
Zinc [6] thousand metric tons	3,466	3,864	3,995	4,056	3,983

r Revised.

[1] In general, major consuming countries only have been included; sum of consumption by excluded minor consumers may be significant; data included for Communist countries (excluding Yugoslavia) are listed as conjectural in source.

[2] Partial, according to source, but apparently includes secondary metal.

[3] Primary and secondary refined.

[4] Chiefly primary, may include some secondary.

[5] Primary only. As reported by the International Tin Council. Non-Communist countries excluded except for Yugoslavia.

[6] Primary and secondary slab.

Source: Yearbook of the American Bureau of Metal Statistics (Forty-Seventh Annual Issue for the year 1967). New York, 1968, 148 pp.

Table 7.—World energy consumption [1] by continental areas

(Million tons of standard coal equivalent unless otherwise specified)

Area [2] and year	Solid fuels	Liquid fuels	Natural and imported gas	Hydro, nuclear, and imported electricity	Total aggregate	Total per capita (kilograms)
North America:						
1963	403	722	592	34	1,751	8,403
1964	424	757	630	37	1,848	8,742
1965	449	795	656	40	1,940	9,052
1966	471	828	707	42	2,048	9,435
Caribbean America:						
1963	5	64	21	2	91	911
1964	5	68	25	2	99	963
1965	5	68	26	2	100	942
1966	5	71	28	2	106	961
Other America:						
1963	5	55	9	4	73	555
1964	6	58	10	4	77	573
1965	6	59	10	4	80	578
1966	6	65	11	5	87	611
Western Europe:						
1963	557	364	22	34	977	2,904
1964	540	414	24	34	1,012	2,982
1965	515	465	28	39	1,047	3,055
1966	486	523	33	43	1,085	3,139
Western Asia:						
1963	5	27	5	(3)	37	439
1964	6	30	5	(3)	41	472
1965	6	33	5	(3)	44	496
1966	6	36	7	(3)	49	538
Far East:						
1963	146	116	8	11	281	293
1964	144	133	9	12	298	304
1965	150	150	9	12	321	321
1966	154	172	8	14	348	340
Oceania:						
1963	30	20	(3)	2	53	3,192
1964	32	23	(3)	2	58	3,442
1965	34	26	(3)	2	62	3,615
1966	35	28	(3)	2	65	3,748
Africa:						
1963	46	28	1	1	76	256
1964	49	31	1	2	82	271
1965	53	32	2	2	88	284
1966	52	36	2	2	92	289
Countries not elsewhere specified:						
1963	975	249	140	12	1,376	1,329
1964	1,020	271	167	13	1,471	1,400
1965	1,040	290	195	14	1,540	1,446
1966	1,080	316	218	15	1,629	1,510
World total:						
1963	2,172	1,644	797	101	4,714	1,490
1964	2,226	1,786	870	105	4,987	1,547
1965	2,257	1,918	931	116	5,223	1,591
1966	2,296	2,075	1,013	125	5,509	1,648

[1] In most cases, data are aggregates of country figures representing apparent inland consumption—the purely arithmetic result of subtracting, from the sum of production and imports, the sum of exports, additions to stocks (where these are known), and bunker loadings. Figures are as reported and may not add to totals shown because of rounding.

[2] Areas listed are those appearing in source and have not been conformed to standard terms used elsewhere in the Minerals Yearbook.

[3] Nil or less than ½ unit.

Source: United Nations. World Energy Supplies. Statistical Papers, Series V, No. 11, New York 1968, pp. 10–13.

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Table 8.—Annual investment expenditures in the steel industry for selected countries

(Million dollars)

	1963	1964	1965	1966	1967
European Economic Community (EEC)	1,469	1,317	932	836	[1] 750
European Free Trade Association (EFTA) [2]	343	260	261	266	272
Other countries:					
Canada	104	191	141	190	NA
Ireland	3	1	1	([3])	NA
Japan [4]	501	460	454	540	843
Spain	82	109	116	143	186
Turkey	17	-------	-------	10	10
United States	1,040	1,600	1,818	1,953	2,173

[1] European Coal and Steel Community Commission. Investment in the Community Coal Mining and Steel Industries. Report on the 1968 Survey. July 1968, p. 8.
[2] Totals given exclude any figures for Denmark and Switzerland in every year; therefore covers reported investments, if any, for Austria, Norway, Portugal, Sweden and United Kingdom.
[3] Less than ½ unit.
[4] Japanese fiscal years.
Source: Except as noted, Organization for Economic Cooperation and Development. The Iron and Steel Industry in 1967 and Trends in 1968 and previous editions of the same publication covering 1964 and 1965, 1965 and 1966, and 1966 and 1967.

Table 9.—Non-Communist world petroleum industry capital expenditures and exploration expenses by geographic area

(Million dollars)

	1963	1964	1965	1966
United States:				
Capital expenditures	5,475	6,100	6,375	7,125
Exploration expenses	600	650	610	650
Total	6,075	6,750	6,985	7,775
Other Western Hemisphere:				
Capital expenditures	1,475	1,425	1,550	1,785
Exploration expenses	205	170	195	210
Total	1,680	1,595	1,745	1,995
Western Europe:				
Capital expenditures	1,750	1,725	2,050	2,500
Exploration expenses	35	90	150	75
Total	1,785	1,815	2,200	2,575
Africa:				
Capital expenditures	500	575	600	560
Exploration expenses	115	115	100	75
Total	615	690	700	635
Middle East:				
Capital expenditures	275	275	625	600
Exploration expenses	30	30	35	50
Total	305	305	660	650
Far East:				
Capital expenditures	775	900	800	840
Exploration expenses	65	75	90	50
Total	840	975	890	890
Unspecified: Capital expenditures (no exploration expenses)	900	1,275	1,175	1,265
Total:				
Capital expenditures	11,150	12,275	13,175	14,675
Exploration expenses	1,050	1,130	1,180	1,110
Total	12,200	13,405	14,355	15,785

Source: Energy Division, Chase Manhattan Bank N.A. Capital Investments of the World Petroleum Industry. November 1967, pp. 24–31.

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Table 10.—Non-Communist world petroleum industry capital expenditure and exploration expenses by industry sector

(Million dollars)

	1963	1964	1965	1966
Capital expenditures:				
Production	5,170	5,565	5,785	5,640
Pipelines	625	555	550	760
Marine	945	1,355	1,225	1,295
Refineries	1,735	1,565	1,365	2,670
Chemical plants	630	625	925	1,340
Marketing	1,735	2,190	2,430	2,410
Other	310	420	395	560
Total	11,150	12,275	13,175	14,675
Exploration expenses	1,050	1,130	1,180	1,110
Grand total	12,200	13,405	14,355	15,785

Source: Energy Division, Chase Manhattan Bank N.A. Capital Investments of the World Petroleum Industry. November, 1967, pp. 24–31.

Table 11.—U.S. direct foreign investment in mineral industries: Value, earnings and income

(Million dollars)

Area and country	Mining and smelting			Petroleum		
	Value	Earnings [1]	Income [1]	Value	Earnings [1]	Income [1]
1964:						
Canada	1,667	191	114	3,187	170	118
Latin American Republics:						
South America:						
Venezuela	(2)	(2)	(2)	2,139	460	461
Other	(2)	(2)	(2)	665	36	35
Total	926	158	151	2,804	496	496
Other	178	26	21	298	14	7
Other Western Hemisphere	250	76	78	488	34	33
Europe:						
EEC	13	(2)	(2)	1,523	−38	24
Non-EEC:						
United Kingdom	2	(2)	---	902	44	28
Other	41	(2)	(2)	677	2	13
Total Europe	56	3	5	3,102	8	64
Africa:						
Republic of South Africa	68	20	15	(2)	(2)	(2)
Other	290	18	17	(2)	(2)	(2)
Total	358	38	32	883	227	223
Middle East	2	---	---	1,240	867	893
Far East	31	3	1	814	45	68
Oceania:						
Australia	100	10	3	(2)	(2)	(2)
Other	---	---	---	(2)	(2)	(2)
Total	100	10	3	453	−6	−6
International shipping	---	---	---	1,064	6	26
Grand total	3,568	505	400	14,333	1,861	1,922
1965:						
Canada	1,755	198	110	r 3,356	183	122
Latin American Republics:						
South America:						
Venezuela	(2)	(2)	(2)	2,033	405	408
Other	(2)	(2)	(2)	679	71	52
Total	r 956	181	167	2,704	476	460
Other	r 158	25	18	r 330	20	8

See footnotes at end of table.

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Table 11.—U.S. direct foreign investment in mineral industries: Value, earnings and income—Continued

(Million dollars)

Area and country	Mining and smelting			Petroleum		
	Value	Earnings [1]	Income [1]	Value	Earnings [1]	Income [1]
1965—Continued						
Other Western Hemisphere	310	85	82	r 512	24	18
Europe:						
EEC	16	(2)	(2)	1,624	−32	18
Non-EEC:						
United Kingdom	2	(2)	(2)	1,093	−6	−4
Other	r 36	(2)	(2)	r 710	−4	3
Total Europe	r 54	8	8	3,427	−42	17
Africa:						
Republic of South Africa	65	34	35	126	(2)	(2)
Other	r 289	27	20	903	(2)	(2)
Total	354	61	55	1,029	240	233
Middle East	r 2	-------	-------	r 1,436	816	813
Far East	34	5	2	r 904	76	107
Oceania:						
Australia	161	10	3	(2)	(2)	(2)
Other	(3)	−2	−2	(2)	(2)	(2)
Total	162	8	1	r 498	−6	−11
International shipping	-------	-------	-------	r 1,101	87	30
Grand total	r 3,785	571	443	r 15,298	1,825	1,798
1966:						
Canada	1,942	191	120	3,606	196	114
Latin American Republics:						
South America:						
Venezuela	(2)	(2)	(2)	1,922	384	385
Other	(2)	(2)	(2)	679	74	78
Total	955	235	218	2,601	458	463
Other	162	28	16	358	21	8
Other Western Hemisphere	364	96	93	579	32	26
Europe:						
EEC	17	(2)	(2)	1,978	−89	17
Non-EEC:						
United Kingdom	3	(2)	(2)	1,167	−25	−15
Other	34	(2)	(2)	832	−15	3
Total Europe	54	10	11	3,977	−79	4
Africa:						
Republic of South Africa	73	45	33	140	(2)	(2)
Other	296	33	25	968	(2)	(2)
Total	369	78	58	1,108	259	243
Middle East	3	-------	-------	1,560	863	852
Far East	37	4	1	907	68	54
Oceania:						
Australia	249	18	6	(2)	(2)	(2)
Other	-------	-------	-------	(2)	(2)	(2)
Total	249	18	6	521	2	−8
International shipping	-------	-------	-------	1,047	40	23
Grand total	4,135	660	524	16,264	1,859	1,778

[1] Earnings is the sum of the U.S. share in the net earnings of subsidiary and branch profits; income is the sum of dividends, interest, and branch profits.
[2] Combined in other industries in source; not listed here.
[3] Less than $500,000.
Note: Detail may not add to totals due to rounding.
Sources: U.S. Dept. of Commerce. Survey of Current Business. V. 45, No. 9 (September 1965) pp. 24–25; v. 46, No. 9 (September 1966), pp. 34–35; v. 47, No. 9 (September 1967) pp. 42–43.

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Table 12.—Non-Communist world tanker fleet

Flag	Number of vessels at yearend		Deadweight tonnage at yearend	
	1965	1966	1965	1966
United States	268	279	6,650	6,758
Panama	149	135	4,285	4,029
Norway	470	457	13,935	15,380
United Kingdom	437	427	11,866	12,319
Liberia	553	595	20,229	22,622
Others	1,181	1,239	30,279	35,561
Total	3,058	3,132	87,244	96,664

Source: Chase Manhattan Bank N.A. Capital Investments of the World Petroleum Industry 1965. 1965, p. 20 and 1966, p. 22.

Table 13.—Indexes of ocean freight rates

(1963=100)

	London tanker bankers panel	Trip charter				
		West Germany		Netherlands (general)	Norway	
		Dry cargo	Tankers		Dry cargo	Tankers
1964	93	101	90	114	100	92
1965	90	110	90	114	112	90
1966	89	100	84	100	97	84
1967: [1]						
First quarter	NA	91	66	[2] 83	92	67
Second quarter	NA	102	181	[2] 82	101	198
Third quarter	NA	111	246	NA	116	260
Fourth quarter	NA	117	152	NA	114	146
Annual average	78	102	154	NA	104	155

	Trip charter				Time charter	
	United Kingdom				Norway (dry cargo)	United Kingdom (dry cargo)
	General	Coal trade	Ore trade	Fertilizer trade		
1964	103	96	103	112	112	114
1965	116	105	120	136	126	128
1966	104	88	94	128	118	126
1967: [1]						
First quarter	97	80	72	146	102	113
Second quarter	104	92	NA	[2] 244	108	116
Third quarter	115	116	[4] 120	[4] 242	131	140
Fourth quarter	134	111	NA	239	126	132
Annual average	111	95	85	186	118	124

NA Not available.
[1] Except as noted, quarterly figures are those for the last month in the quarter.
[2] Actual quarterly average.
[3] June not available, July used instead.
[4] September not available, October used instead.
Source: United Nations. Monthly Bulletin of Statistics. New York, June 1968, pp. xx–xxi.

Table 14.—Summary of selected mineral commodity groups transiting the Panama Canal

(Thousand metric tons)

Commodity group	Fiscal years				
	1963	1964	1965	1966	1967
Metal ores	7,932	8,190	8,749	8,445	6,774
Metals, including scrap	3,357	4,827	3,856	3,132	5,591
Iron and steel manufactures [1]	2,172	2,614	3,905	5,217	5,335
Nitrogen products	720	751	797	742	619
Phosphates	1,990	2,408	3,400	3,902	3,650
Coal and coke	5,347	6,668	6,803	7,264	9,506
Petroleum	13,011	13,725	15,545	15,979	17,071
Total	34,529	39,183	43,055	44,681	48,546

[1] May include some materials not normally included among mineral commodities.
Source: Executive Planning Staff. Panama Canal-Selected Commodity Movements. Mar. 1, 1968.

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Table 15.—Nonferrous metal prices in the United States

(Average, cents per pound except where otherwise noted) [1]

Year and month	Aluminum [2]	Copper [3]	Lead [4]	Zinc [5]	Tin [6]	Silver [7]
1963	22.623	30.600	10.987	11.997	116.652	127.912
1964	23.741	31.960	13.396	13.568	157.595	129.300
1965	24.507	35.017	15.800	14.500	178.202	129.300
1966	24.500	36.170	14.915	14.500	164.070	129.300
1967:						
January	24.738	37.872	15.000	14.500	153.911	129.300
February	25.000	38.103	15.000	14.500	154.396	129.300
March	25.000	38.076	15.000	14.500	153.733	129.300
April	25.000	38.170	14.800	14.500	153.394	129.300
May	25.000	38.118	13.800	13.563	153.170	129.591
June	25.000	38.083	13.800	13.551	155.084	130.100
July	25.000	38.295	13.800	13.500	154.388	159.290
August	25.000	39.090	13.800	13.500	152.511	174.978
September	25.000	([8])	13.800	13.500	151.019	167.950
October	25.000	([8])	13.800	13.500	151.990	178.590
November	25.000	([8])	13.800	13.500	155.038	195.320
December	25.000	([8])	13.800	13.500	152.681	206.600
Annual average	24.978	[9] 38.226	14.183	13.843	153.434	154.968

[1] As recorded by Engineering and Mining Journal.
[2] Unalloyed ingot, 99.5 percent, delivered United States.
[3] Electrolytic copper, domestic refineries, Atlantic seaboard.
[4] Refined lead, New York.
[5] Prime Western slab, f.o.b., East St. Louis.
[6] Straits tin, New York.
[7] Cents per troy ounce, 0.999 fine, New York.
[8] Average suspended.
[9] Based on January to August.

Table 16.—Nonferrous metal prices in the United Kingdom

(Average, £ per long ton unless otherwise noted) [1]

Year and month	Aluminum [2]	Copper [3]	Lead [4]	Zinc [5]	Tin [6]	Silver [7]
1963	181.000	234.775	63.438	76.704	910.167	110.115
1964	190.900	352.879	101.250	118.125	1,240.917	111.920
1965	196.000	469.875	115.000	112.900	1,414.133	111.583
1966	196.000	554.471	95.150	101.992	1,296.588	111.807
1967:						
January	196.000	451.358	79.900	101.446	1,198.954	111.869
February	196.000	442.850	80.458	102.425	1,201.375	111.750
March	196.000	398.596	82.846	101.367	1,204.308	111.673
April	196.000	361.000	82.246	98.700	1,216.650	111.543
May	196.000	376.000	82.854	99.863	1,219.433	118.756
June	196.000	368.433	82.771	99.558	1,222.454	145.284
July	196.000	361.904	83.921	97.000	1,220.525	150.869
August	196.000	379.067	84.529	97.496	1,194.842	151.307
September	196.000	384.713	82.350	96.029	1,185.879	145.857
October	196.000	413.092	81.963	95.796	1,190.933	154.455
November	206.875	523.888	87.838	104.192	1,273.817	181.024
December	228.666	560.554	94.167	112.688	1,351.896	209.342
Annual average	199.628	417.338	83.763	100.429	1,222.458	141.977

[1] London Metal Exchange, average settlement prices.
[2] 99.5 percent ingots, producers price.
[3] London Metal exchange, electrolytic wirebar.
[4] London Metal exchange, refined pig lead, 99.97 percent.
[5] London Metal exchange, virgin zinc, 98 percent.
[6] London Metal exchange, standard tin.
[7] Pence per troy ounce, 0.999 fine as reported by Engineering and Mining Journal.

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Table 17.—Nonferrous metal prices in Canada

(Average, Canadian cents per pound unless otherwise noted)

Year and month	Aluminum [1]	Copper [2]	Lead [3]	Zinc [3]	Silver [4]
1963	NA	31.500	11.042	12.206	138.457
1964	25.42	33.342	13.418	13.566	139.962
1965	26.00	37.639	15.500	14.500	139.879
1966	26.00	44.940	14.943	14.500	139.803
1967:					
January	26.31	46.349	14.000	14.500	140.071
February	26.50	47.250	14.000	14.500	140.280
March	26.50	47.250	14.000	14.500	140.400
April	26.50	47.250	14.000	14.500	140.455
May	26.50	47.250	14.000	13.784	140.480
June	26.50	47.250	14.000	13.659	180.736
July	26.50	47.250	14.000	13.500	188.715
August	26.50	47.250	14.000	13.500	188.239
September	26.50	47.250	14.000	13.500	180.590
October	26.50	47.250	14.000	13.500	191.619
November	26.50	47.875	14.000	13.500	209.950
December	26.50	51.000	14.000	13.500	222.874
Annual average	26.48	47.539	14.000	13.870	172.080

[1] Ingot, 99.5 percent.
[2] Electrolytic ingot, prompt delivery at Toronto.
[3] Producers' prices, carload quantities, communicated by Cominco Ltd; pig lead and prime western zinc.
[4] Canadian cents, per troy ounce, Cominco Ltd. price.
Source: Yearbook of the American Bureau of Metal Statistics. Forty-Seventh Annual Issue for the Year 1967.

Table 18.—Mineral commodity export price indexes [1]

(1963=100)

Year and quarter	Metal ores	Fuels	All crude minerals
1964	108	100	102
1965	114	101	104
1966	[2] 115	101	104
1967:			
January to March	108	101	103
April to June	107	100	102
July to September	108	101	102
October to December	111	101	103
Annual average	109	101	103

[1] United Nations. Monthly Bulletin of Statistics. June 1968, Special table C II, p. xvii.
[2] Derived from quarterly averages; annual figure reported in source as 105 obviously is in error.

Table 19.—Analysis of export price indexes [1]

(1963=100)

Year and quarter	Developed areas		Less developed areas	
	Total minerals	Nonferrous base metals	Total minerals	Nonferrous base metals
1964	105	116	102	124
1965	106	129	103	146
1966	107	144	103	177
1967:				
January to March	105	138	102	162
April to June	103	130	102	146
July to September	104	131	102	148
October to December	106	143	102	168
Annual average	105	135	102	156

[1] United Nations. Monthly Bulletin of Statistics. June 1968, Special Table C III, p. xviii.

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Table 20.—Leading world producers of bauxite [1]

(Thousand metric tons)

Country	1963	1964	1965	1966	1967 p
Jamaica [2]	7,014	7,937	8,699	9,138	9,392
Surinam	3,438	3,993	4,346	4,585	e 5,300
U.S.S.R. e [3]	4,300	4,300	4,700	4,800	5,000
Australia	360	796	1,186	1,827	4,236
Guyana	2,380	2,518	2,919	3,358	3,381
France	2,029	2,433	2,662	2,811	2,813
Yugoslavia	1,285	1,293	1,574	1,887	2,131
Greece	1,277	1,047	1,270	1,344	1,692
United States	1,549	1,626	1,680	1,824	1,680
Hungary	1,363	1,477	1,478	1,429	1,649
Guinea, Republic of	1,664	1,678	1,870	1,609	1,617
Total	26,659	29,098	32,384	34,612	38,891
All others	4,048	4,291	5,146	5,336	5,717
World total e	30,707	33,389	37,530	39,948	44,608

e Estimate. p Preliminary.
[1] Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.
[2] Bone dry equivalent of bauxite shipments and bauxite converted into alumina and including cement grade as follows: 1965, 48,243; 1966, 76,095; and 1967, 124,814.
[3] Excludes nepheline concentrates and alunite ores.

Table 21.—Leading world producers of aluminum [1]

(Thousand metric tons)

Country	1963	1964	1965	1966	1967 p
United States	2,098	2,316	2,499	2,693	2,966
U.S.S.R. e	760	800	840	890	965
Canada	653	764	753	808	874
Norway	225	261	279	324	362
France	298	316	341	364	361
Japan	224	266	294	337	356
Germany, West	209	220	234	244	253
Italy	91	116	124	128	128
Total	4,558	5,059	5,364	5,788	6,265
All others	765	853	924	1,072	1,186
World total e	5,323	5,912	6,288	6,860	7,451

e Estimate. p Preliminary.
[1] Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.

Table 22.—Leading world mine producers of copper [1]

(Copper content of ore, recoverable where indicated, thousand metric tons)

Country	1963	1964	1965	1966	1967 p
United States [2]	1,101	1,131	1,226	1,296	866
U.S.S.R. e	600	650	700	750	800
Chile	604	633	606	664	664
Zambia	588	632	696	623	662
Canada [2]	411	442	462	461	547
Congo (Kinshasa) [3]	271	277	289	316	321
Peru	[2] 180	[2] 176	[2] 180	176	181
South Africa, Republic of	55	59	60	125	[3] 128
Japan	107	106	107	112	118
Total	3,917	4,106	4,326	4,523	4,287
All others	701	695	698	736	699
World total e	4,618	4,801	5,024	5,259	4,986

e Estimate. p Preliminary.
[1] Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.
[2] Recoverable.
[3] Smelter production.

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Table 23.—Leading world producers of iron ore, iron ore concentrates, and iron ore agglomerates [1]

(Thousand metric tons)

Country	1963	1964	1965	1966	1967 p
U.S.S.R.	137,475	145,584	153,432	160,271	168,000
United States	74,780	86,198	88,842	91,594	85,530
France	57,892	60,938	59,532	55,060	49,220
Canada	27,346	34,769	36,250	41,344	42,322
Sweden	23,637	26,619	29,485	28,206	28,270
China, mainland e	35,000	37,000	39,000	40,000	28,000
India (including Goa)	19,995	21,363	23,660	26,336	26,157
Brazil	11,219	16,962	18,160	23,254	23,500
Australia	5,603	5,759	6,803	11,608	18,814
Liberia	7,520	12,999	15,959	16,859	18,224
Venezuela	11,747	15,656	17,510	17,759	17,005
United Kingdom	15,151	16,588	15,662	13,877	12,944
Chile	8,507	9,853	12,145	12,246	11,025
Total	435,872	490,288	516,440	538,414	529,011
All others	87,570	91,015	100,864	101,012	100,286
World total e	523,442	581,303	617,304	639,426	629,297

e Estimate. p Preliminary.
[1] Include additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.

Table 24.—Leading world producers of steel ingots and castings [1]

(Thousand metric tons)

Country	1963	1964	1965	1966	1967 p
United States	99,119	115,281	119,259	121,654	115,406
U.S.S.R.	80,226	85,034	91,021	96,907	102,200
Japan	31,501	39,799	41,161	47,784	62,154
Germany, West	31,597	37,339	36,821	35,316	36,744
United Kingdom	22,881	26,651	27,444	24,705	24,279
France	17,431	19,505	19,340	19,585	19,675
Italy	10,157	9,793	12,681	13,639	15,890
China, mainland e	12,000	14,000	15,000	16,000	11,000
Poland	8,004	8,573	9,088	9,850	10,451
Czechoslovakia	7,598	8,377	8,598	9,128	9,800
Belgium	7,528	8,731	9,169	8,917	9,635
Canada	7,436	8,281	9,134	9,074	8,795
Total	335,478	381,364	398,716	412,559	426,029
All others	51,501	56,642	60,584	63,500	66,900
World total e	386,979	438,006	459,300	476,059	492,929

e Estimate. p Preliminary.
[1] Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook. Compiled Sept. 30, 1968.

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Table 25.—Leading world mine producers of lead [1]

(Lead content of ore, recoverable where indicated, thousand metric tons)

Country	1963	1964	1965	1966	1967 p
U.S.S.R e	315	330	350	375	400
Australia	417	381	368	371	378
Canada	181	187	275	293	308
United States [2]	230	259	273	297	288
Mexico	190	175	170	e 179	e 171
Peru [2]	149	151	154	145	158
Yugoslavia	114	113	106	103	106
Bulgaria	89	91	e 100	e 100	103
China, mainland e	100	100	100	100	90
Morocco	74	71	77	76	78
Sweden	71	67	69	69	72
South-West Africa, Territory of [2]	75	94	88	85	70
Korea, North e	50	55	60	60	65
Japan	53	54	55	63	64
Spain	62	58	57	62	63
Germany, West	53	49	50	55	59
Ireland	-------	1	3	40	58
Total	2,223	2,236	2,355	2,473	2,531
All others	295	295	347	382	383
World total e	2,518	2,531	2,702	2,855	2,914

e Estimate. p Preliminary.
[1] Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.
[2] Recoverable.

Table 26.—Leading world producers of manganese ore [1]

(Thousand metric tons)

Country	1963	1964	1965	1966	1967 p
U.S.S.R	6,663	7,096	7,576	e 7,000	e 7,200
South Africa, Republic of	1,308	1,320	1,567	1,693	1,817
India, including Goa	1,296	1,405	1,615	1,678	1,599
Brazil	1,254	1,352	1,396	1,239	1,145
Gabon	637	960	1,280	1,274	1,125
China, mainland e	1,000	1,000	1,000	1,000	700
Australia	37	62	104	282	e 550
Ghana	407	462	604	587	498
Total	12,602	13,657	15,142	14,753	14,634
All others	2,121	2,190	2,490	2,416	2,439
World total e	14,723	15,847	17,632	17,169	17,073

e Estimate. p Preliminary.
[1] Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.

Table 27.—Leading world mine producers of tin [1]

(Tin content of ore, long tons)

Country	1963	1964	1965	1966	1967 p
Malaysia	59,947	60,004	63,670	68,886	72,121
Bolivia	22,209	24,319	23,036	25,626	26,890
U.S.S.R [2]	21,000	22,000	23,000	24,000	25,000
Thailand	15,585	15,597	19,047	22,565	22,489
China, mainland [2]	28,000	25,000	25,000	22,000	20,000
Indonesia	12,947	16,345	14,698	12,527	13,579
Nigeria	8,723	8,721	9,547	9,354	9,340
Total	168,411	171,986	177,998	184,958	189,419
All others	22,689	21,614	23,302	25,842	26,681
World total e	191,100	193,600	201,300	210,800	216,100

e Estimate. p Preliminary.
[1] Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.
[2] Estimated smelter production.

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Table 28.—Leading world mine producers of zinc [1]

(Zinc content of ore, recoverable where indicated, thousand metric tons)

Country	1963	1964	1965	1966	1967 p
Canada	451	662	826	950	1,133
U.S.S.R. e [2]	400	430	470	500	535
United States [2]	480	522	554	519	498
Australia	357	350	355	375	404
Peru [3]	195	237	254	258	318
Mexico	240	236	225	219	288
Japan	198	216	221	254	262
Poland	147	151	152	150	196
Italy	107	111	116	116	124
Congo (Kinshasa)	104	106	119	113	122
Korea, North e	100	100	105	105	115
Germany, West	108	111	109	107	106
Total	2,887	3,232	3,506	3,666	4,101
All others	779	793	803	822	815
World total e	3,666	4,025	4,309	4,488	4,916

e Estimate. p Preliminary.
[1] Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.
[2] Recoverable.

Table 29.—Leading world producers of hydraulic cement [1]

(Thousand metric tons)

Country	1963	1964	1965	1966	1967 p
U.S.S.R.	61,018	64,934	72,388	79,992	84,800
United States (including Puerto Rico)	62,832	65,728	66,318	68,522	65,807
Japan	29,948	32,981	32,689	38,265	42,993
Germany, West	29,218	33,632	34,133	34,739	31,507
Italy	22,088	22,840	20,695	22,874	26,272
France	18,134	21,537	22,365	23,304	24,600
United Kingdom	14,060	16,966	17,191	16,750	17,577
Spain	7,748	8,500	10,219	11,807	13,099
India	9,355	9,690	10,578	11,052	11,700
Poland	7,674	8,761	9,573	10,041	11,138
China, mainland e	10,000	10,500	11,000	11,000	8,000
Germany, East	5,458	5,767	6,087	6,456	7,188
Canada	6,364	7,119	7,645	8,157	7,160
Rumania	4,369	4,752	5,405	5,886	6,338
Mexico	3,762	4,418	4,322	4,907	e 6,258
Total	292,028	318,125	330,608	353,252	364,437
All others	86,107	97,561	104,974	111,193	115,472
World total e	378,135	415,686	435,582	464,445	479,909

e Estimate. p Preliminary.
[1] Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.

Table 30.—Leading world phosphate rock production [1]

(Thousand metric tons)

Country	1963	1964	1965	1966	1967 p
United States	20,174	23,328	26,704	35,420	36,079
U.S.S.R. e [2]	8,570	11,030	13,900	15,190	16,350
Morocco	8,548	10,098	9,824	9,439	10,545
Tunisia	2,371	2,751	3,040	3,216	2,810
Nauru Island [3]	1,572	1,849	1,496	2,037	e 2,000
Total	41,235	49,056	54,964	65,302	67,784
All others	7,506	7,994	8,896	10,491	10,919
World total e	48,741	57,050	63,860	75,793	78,703

e Estimate. p Preliminary.
[1] Includes output of all major crude mineral sources of phosphate, including apatite, guano, and similar materials. Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook. Compiled Sept. 30, 1968.
[2] Includes material described by the Russians as "sedimentary rock."
[3] Exports.

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Table 31.—Leading world producers of marketable potash [1]

(Thousand metric tons, K_2O equivalent)

Country	1963	1964	1965	1966	1967 p
United States	2,598	2,628	2,848	3,012	2,993
U.S.S.R. e	2,050	2,200	2,350	2,550	2,760
Germany, West	1,948	2,201	2,385	2,291	e 2,300
Canada	569	779	1,353	1,805	2,207
Germany, East	1,845	1,857	1,926	2,006	e 2,200
France	1,722	1,807	1,888	1,782	1,780
Total	10,732	11,472	12,750	13,446	14,240
All others	568	828	950	1,154	1,160
World total e	11,300	12,300	13,700	14,600	15,400

e Estimate. p Preliminary.
[1] Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.

Table 32.—Leading world producers of pyrite [1]

(Gross weight, thousand metric tons)

Country	1963	1964	1965	1966	1967 p
Japan	3,894	4,146	4,323	4,734	4,527
U.S.S.R. e	3,200	3,200	3,300	3,300	3,500
Spain	2,027	2,393	2,424	2,418	2,291
China, mainland e	1,200	1,300	1,500	1,500	1,500
Italy	1,402	1,395	1,402	1,304	1,411
Cyprus	923	685	994	987	e 1,200
United States	838	861	889	886	875
Norway	721	719	709	677	634
Germany, West	355	424	439	450	556
South Africa, Republic of	419	432	428	481	553
Portugal	602	607	613	558	528
Finland	541	547	582	516	e 516
Korea, North e	400	420	450	500	500
Sweden	403	452	441	434	e 440
Yugoslavia	356	428	407	378	e 425
Total	17,281	18,009	18,901	19,123	19,456
All others	2,519	2,591	2,639	2,797	2,954
World total e	19,800	20,600	21,540	21,920	22,410

e Estimate. p Preliminary.
[1] Includes cupreous pyrites. Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.

Table 33.—Leading world elemental sulfur producers [1]

(Thousand metric tons)

Country	1963	1964	1965	1966	1967 p
United States	5,923	6,350	7,449	8,374	8,416
Canada (sales)	1,134	1,622	1,876	1,852	2,107
Mexico	1,544	1,725	1,586	1,706	1,891
France	1,409	1,511	1,521	1,540	1,645
U.S.S.R. e	1,350	1,350	1,430	1,430	1,500
Poland	235	295	431	477	e 475
Japan	234	260	250	283	317
China, mainland e	250	250	250	250	250
Germany, East	120	125	125	128	e 130
Germany, West	86	78	77	80	105
Total	12,285	13,566	14,995	16,120	16,836
All others	590	574	535	590	599
World total e	12,875	14,140	15,530	16,710	17,435

e Estimate. p Preliminary.
[1] Includes Frasch-process sulfur, sulfur from sulfur ores, and byproduct sulfur from other ores, natural gas, oil refinery operations and oil shale. Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.

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Table 34.—Leading world producers of coal (all grades) [1]

(Million metric tons)

Country	1963			1964			1965			1966			1967 [p]		
	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total	Lignite	Bituminous and anthracite	Total
U.S.S.R.	137	395	532	145	409	554	150	428	578	146	439	585	• 151	• 444	• 595
United States	2	430	432	3	455	458	3	475	478	4	493	497	4	507	511
Germany, East	254	2	256	257	2	259	251	2	253	249	2	251	• 250	• 2	252
China, mainland •	NA	270	270	NA	290	290	NA	300	300	NA	325	325	NA	225	225
Germany, West	107	[2] 144	251	111	[2] 144	255	102	[2] 137	239	98	[2] 127	225	97	[2] 113	210
United Kingdom	-----	199	199	------	197	197	------	191	191	------	177	177	------	175	175
Poland	15	113	128	20	118	138	23	119	142	25	122	147	• 24	124	148
Czechoslovakia	73	28	101	76	28	104	73	28	101	74	27	101	65	• 26	91
India	1	66	67	2	62	64	2	70	72	3	71	74	3	71	74
Australia	19	25	44	19	28	47	21	32	53	22	34	56	24	35	59
France	2	48	50	2	53	55	3	51	54	3	50	53	3	48	51
South Africa, Republic of	-----	42	42	------	45	45	------	48	48	------	48	48	------	49	49
Japan	1	52	53	1	51	52	1	50	51	(3)	51	51	(3)	47	47
Bulgaria	20	1	21	24	1	25	24	1	25	25	1	26	• 29	• 1	• 30
Hungary	27	4	31	27	4	31	27	4	31	26	4	30	23	4	27
Yugoslavia	26	1	27	28	1	29	29	1	30	28	1	29	26	1	27
Total	684	1,820	2,504	715	1,888	2,603	709	1,937	2,646	703	1,972	2,675	699	1,872	2,571
All others	27	118	145	27	119	146	28	123	151	30	123	153	30	121	151
World total •	711	1,938	2,649	742	2,007	2,749	737	2,060	2,797	733	2,095	2,828	729	1,993	2,722

• Estimate. [p] Preliminary. NA Not available.

[1] Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.

[2] Includes pitch coal.

[3] Less than ½ unit.

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Table 35.—Leading world producers of marketed natural gas [1]

(Billion cubic feet)

Country	1963	1964	1965	1966	1967 p
United States	14,667	15,462	16,040	17,207	18,171
U.S.S.R.	3,231	3,892	4,570	5,110	5,601
Canada	1,111	1,328	1,442	1,342	1,465
Rumania [2]	504	547	610	657	724
Italy	257	271	276	312	331
Venezuela	218	237	250	269	293
Mexico	206	235	250	255	276
Total	20,194	21,972	23,438	25,152	26,861
All others	972	1,105	1,260	1,460	1,750
World total e	21,166	23,077	24,698	26,612	28,611

e Estimate. p Preliminary.
[1] Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.
[2] Including associated (casing lead) gas.

Table 36.—Leading world producers of crude oil [1]

(Million 42-gallon barrels)

Country	1963	1964	1965	1966	1967 p
United States	2,753	2,787	2,849	3,028	3,216
U.S.S.R.	1,504	1,644	1,786	1,948	2,116
Venezuela	1,186	1,242	1,268	1,230	1,293
Iran	538	619	688	771	e 952
Saudi Arabia	595	628	739	873	948
Kuwait	705	775	792	831	837
Libya	168	316	445	553	637
Iraq	423	462	482	505	446
Canada	258	275	296	321	353
Algeria	184	205	202	257	e 282
Indonesia [2]	168	171	179	168	185
Kuwait-Saudi Arabia Neutral Zone	115	131	132	153	153
Trucial States	18	67	103	132	139
Mexico	115	116	118	121	133
Total	8,730	9,438	10,079	10,891	11,690
All others	809	873	978	1,125	1,200
World total e	9,539	10,311	11,057	12,016	12,890

e Estimate. p Preliminary.
[1] Includes additions and revisions to data appearing elsewhere in the 1967 Minerals Yearbook (all volumes). Compiled Sept. 30, 1968.
[2] Includes output of West Irian in all years, including 1963; this area officially become a part of Indonesia on May 1, 1963.

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Table 37.—World trade in bauxite

(Thousand metric tons)

Sources	Destinations						
	Canada	United States	Europe		Japan	Other countries	Total
			Communist [1]	Non-Communist			
1965:							
United States	86	XX	---	7	(2)	56	149
Caribbean America	---	8,368	---	---	---	---	8,368
South America	1,667	4,248	---	189	22	31	6,157
Europe:							
Communist [3]	---	5	808	913	---	---	1,726
Non-Communist	---	37	460	849	---	10	1,356
Africa	78	10	118	501	---	6	713
Non-Communist Asia	---	---	4	76	1,176	249	1,505
Oceania	---	---	---	230	---	391	621
Total	1,831	12,668	1,390	2,765	1,198	743	20,595
1966:							
United States	9	XX	---	7	---	47	63
Caribbean America	---	8,466	---	---	---	(2)	8,466
South America	1,605	4,744	---	208	22	58	6,637
Europe:							
Communist [3]	---	---	1,124	966	---	10	2,100
Non-Communist	---	40	425	984	---	6	1,455
Africa	---	10	---	545	---	6	561
Non-Communist Asia	---	(2)	---	206	1,212	366	1,784
Oceania	---	---	---	148	214	33	395
Total	1,614	13,260	1,549	3,064	1,448	526	21,461

XX Not applicable.
[1] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, U.S.S.R. and Yugoslavia.
[2] Less than ½ unit.
[3] Hungary and Yugoslavia.

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Table 38.—World trade in unrefined and refined copper by major producers

(Thousand metric tons)

Sources	Destinations									
	United States	Belgium-Luxembourg	France	West Germany	Italy	U.S.S.R.	United Kingdom	Japan	Other and unreported	Total
1965:										
Canada	64	1	10	3	1	-------	96	-------	6	181
United States	XX	1	35	31	48	-------	65	20	114	314
Chile	184	6	18	73	24	-------	82	-------	104	491
Peru	34	-------	-------	1	-------	-------	-------	-------	3	38
Belgium-Luxembourg	(1)	XX	93	54	11	-------	4	-------	101	263
Germany, West	2	5	5	XX	2	1	16	-------	73	104
U.S.S.R.[2]	-------	-------	-------	-------	-------	XX	-------	-------	93	93
United Kingdom	(1)	3	2	8	1	-------	XX	-------	33	47
Congo (Kinshasa)[3]	NA	NA	NA	NA	NA	NA	NA	NA	278	278
Zambia	3	1	53	101	62	2	274	91	96	683
Other countries[4]	14	11	3	15	(1)	-------	10	-------	13	66
Total	301	28	219	286	149	3	547	111	914	2,558
1966:										
Canada	77	-------	8	1	(1)	-------	83	-------	4	173
United States	XX	1	32	29	47	-------	40	22	85	256
Chile	181	13	34	117	40	-------	99	10	54	548
Peru	34	-------	-------	-------	-------	-------	-------	-------	-------	34
Belgium-Luxembourg	1	XX	102	36	12	-------	4	1	107	263
Germany, West	10	3	20	XX	4	XX	29	(1)	86	152
U.S.S.R.[2]	-------	-------	-------	-------	-------	-------	-------	-------	120	120
United Kingdom	5	2	7	9	2	-------	XX	-------	27	52
Congo (Kinshasa)[3]	NA	NA	NA	NA	NA	NA	NA	NA	311	311
Zambia	-------	8	54	83	56	3	199	89	107	599
Other countries[4]	7	12	9	16	1	-------	17	2	25	89
Total	315	39	266	291	162	3	471	124	926	2,597

NA Not available. XX Not applicable.
[1] Less than ½ unit.
[2] Source: Trade returns of the U.S.S.R.
[3] Source: Trade returns of the Republic of the Congo (Kinshasa).
[4] Australia, Austria, France, Japan, Mexico, Netherlands and Sweden.
Source: Except as otherwise noted, Metallgessellshaft Aktiengessellschaft. Metal Statistics 1957–66. 54th Annual Issue Frankfurt am Main. 1967, pp. 143–197.

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Table 39.—World trade in iron ore, concentrates, and agglomerates

(Thousand metric tons)

Sources	Destinations													
	Canada	United States	European Economic Community				Communist Europe			Other Europe		Japan	Other countries	Total
			Belgium-Luxembourg	West Germany	Italy	Other	Czechoslovakia	Poland	Other [1]	United Kingdom	Other			
1965:														
Canada	XX	24,136	541	893	577	383	-------	-------	-------	2,962	-------	1,801	-------	31,293
United States	4,633	XX	XX	93	-------	-------	-------	-------	-------	-------	-------	2,470	2	7,198
Brazil	361	2,323	756	3,377	1,396	937	357	106	321	635	464	841	858	12,732
Chile	-------	2,766	50	708	-------	-------	-------	-------	-------	-------	-------	6,891	315	10,730
Peru	-------	684	157	1,102	266	207	-------	-------	-------	-------	-------	3,958	-------	6,374
Venezuela	20	12,317	64	1,903	773	59	-------	-------	-------	1,740	-------	129	-------	17,005
France	-------	-------	14,673	5,984	-------	-------	-------	-------	-------	89	-------	-------	2	20,748
Sweden	-------	57	5,740	10,059	90	1,097	153	778	43	6,224	643	-------	-------	24,884
U.S.S.R	-------	-------	-------	447	-------	-------	7,966	7,353	6,590	511	1,243	-------	28	24,138
Liberia	-------	3,170	991	5,776	1,841	1,613	-------	-------	-------	1,654	362	261	-------	15,668
Mauritania	-------	139	576	1,181	996	1,490	-------	-------	-------	1,554	-------	-------	30	5,966
India	24	22	169	615	277	137	747	309	661	-------	406	7,868	27	11,262
Malaysia	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	6,648	92	6,740
Other	-------	73	130	3,586	1,923	1,569	197	596	132	3,355	1,311	5,516	365	18,753
Total	5,038	45,687	23,847	35,724	8,139	7,492	9,420	9,142	7,747	18,724	4,429	36,383	1,719	213,491
1966:														
Canada	XX	24,672	85	709	1,152	594	-------	-------	-------	2,257	-------	1,717	-------	31,186
United States	4,451	XX	28	70	-------	1	-------	-------	-------	-------	-------	4,300	1	8,851
Brazil	391	3,025	437	2,976	771	816	395	279	-------	733	452	1,839	796	12,910
Chile	-------	2,433	104	572	-------	-------	-------	-------	-------	-------	-------	7,873	106	11,088
Peru	-------	704	-------	430	262	306	-------	-------	-------	-------	-------	4,606	-------	6,308
Venezuela	17	13,115	36	1,606	876	87	-------	-------	-------	1,300	-------	-------	-------	17,037
France	-------	-------	13,373	4,758	-------	-------	-------	-------	-------	63	-------	-------	-------	18,194
Sweden	-------	79	5,289	9,260	498	787	207	687	57	5,154	487	-------	39	22,544
U.S.S.R	-------	-------	-------	532	-------	-------	7,662	7,850	7,594	956	1,263	196	65	26,118
Liberia	-------	3,298	961	6,251	1,674	2,135	-------	-------	-------	1,630	548	325	-------	16,822
Mauritania	-------	120	773	1,214	1,305	1,847	-------	15	-------	1,596	100	165	-------	7,135
India	-------	-------	160	649	23	52	753	210	551	-------	335	10,925	-------	13,658
Malaysia	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	5,697	75	5,772
Other	-------	48	110	2,524	1,292	1,395	285	501	109	2,171	1,469	8,359	336	18,599
Total	4,859	47,494	21,356	31,551	7,853	8,020	9,302	9,542	8,311	15,860	4,654	46,002	1,418	216,222

XX Not applicable.
[1] Albania, Bulgaria, East Germany, Hungary, Rumania and U.S.S.R. (excludes Yugoslavia).

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Table 40.—Major world trade in steel ingots and semimanufacture in 1965, by areas

(Thousand metric tons)

Exporting country and area	Destinations [1]														
	North America		Latin America [2]	Europe				Africa	Near East [4]	South Asia and Far East			Oceania	Unallocated	Total
										Non-Communist		Communist [5]			
	United States	Canada		European Economic Community	European Free Trade Association	Other Non-Communist	Communist [3]			Japan	Other				
North America:															
Canada	569.9	XX	144.8	7.9	10.2	50.9	-------	13.2	5.0	.2	10.4	.1	21.3	-----	833.9
United States	XX	539.8	533.2	81.6	46.7	199.8	.8	87.4	69.9	7.3	690.8	-----	17.8	-----	2,275.1
Total	569.9	539.8	678.0	89.5	56.9	250.7	.8	100.6	74.9	7.5	701.2	.1	39.1	-----	3,109.0
Europe:															
European Economic Community:															
Belgium-Luxembourg	1,517.0	330.0	442.0	4,887.0	917.0	480.0	70.0	302.0	301.0	1.0	215.0	12.0	42.0	-----	9,516.0
France	809.5	144.3	259.8	2,749.7	988.1	352.9	128.0	617.9	283.4	----	104.6	86.6	42.9	-----	6,567.7
Germany, West	1,105.9	238.1	340.8	3,904.6	1,742.5	873.5	383.0	276.9	331.8	1.2	255.6	77.7	15.2	-----	9,546.8
Italy	232.4	58.3	47.0	588.3	176.3	217.1	286.6	462.6	232.4	----	82.5	48.8	3.0	-----	2,435.3
Netherlands	95.5	79.6	37.8	800.4	417.4	327.5	11.7	51.1	23.9	1.1	54.7	3.6	.3	-----	1,904.6
Subtotal	3,760.3	850.3	1,127.4	12,930.0	4,241.3	2,251.0	879.3	1,710.5	1,172.5	3.3	712.4	228.7	103.4	-----	29,970.4
European Free Trade Association:															
Austria	3.8	4.4	14.3	573.2	145.1	31.8	290.9	1.9	51.6	.1	10.2	-----	1.2	7.2	1,135.7
Denmark	-------	-------	.4	40.1	95.2	2.0	1.5	.6	.6	----	1.3	-----	-----	-----	141.7
Norway	23.2	-------	2.0	81.4	194.9	22.7	7.4	3.9	1.5	----	1.7	.2	.1	-----	339.0
Portugal	.8	-------	-------	.8	.3	8.2	-------	15.2	.5	----	-------	-----	-----	-----	25.8
Sweden	64.5	10.8	35.3	300.4	336.1	103.8	73.3	8.8	8.0	1.1	15.0	3.5	5.1	-----	965.7
Switzerland [6]	6.3	2.3	.6	38.5	18.8	2.6	.1	1.0	.5	----	.5	-----	.1	.1	71.4
United Kingdom	650.9	219.0	287.3	451.5	516.7	441.5	132.7	466.4	147.0	1.9	321.8	32.3	256.9	-----	3,925.9
Subtotal	749.5	236.5	339.9	1,485.9	1,307.1	612.6	505.9	497.8	209.7	3.1	350.5	36.0	263.4	7.3	6,605.2
Other non-Communist Europe:															
Finland	-------	-------	1.4	1.8	19.1	-------	1.0	-------	1.2	----	2.1	-----	-----	-----	26.6
Greece	-------	-------	-------	3.8	-------	14.1	6.5	9.4	1.3	----	-------	-----	-----	-----	35.1
Spain	-------	-------	4.9	8.9	1.7	1.0	-------	.3	.1	.3	-------	-----	-----	-----	17.2
Subtotal	-------	-------	6.3	14.5	20.8	15.1	7.5	9.7	2.6	.3	2.1	-----	-----	-----	78.9

See footnotes at end of table.

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Table 40.—Major world trade in steel ingots and semimanufacture in 1965, by areas—Continued

(Thousand metric tons)

Exporting country and area	Destinations [1]														
	North America		Latin America [2]	Europe				Africa	Near East [4]	South Asia and Far East			Oceania	Unallocated	Total
	United States	Canada		European Economic Community	European Free Trade Association	Other Non-Communist	Communist [3]			Non-Communist		Communist [5]			
										Japan	Other				
Europe—Continued															
European Communist Countries:															
Czechoslovakia	-------	22.4	1.9	179.6	178.9	60.6	1,355.5	69.7	96.3	----	79.7	-----	-----	-----	2,044.6
Germany, East [7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	84.0	84.0
Hungary	-------	-------	.3	142.7	76.0	18.7	355.7	32.0	130.0	----	38.2	7.1	-----	-----	800.7
Poland	77.5	-------	15.1	13.9	74.8	34.0	548.6	36.7	37.3	----	63.2	37.6	-----	-----	938.7
Rumania	-------	-------	.4	66.5	6.7	-------	620.2	2.7	9.6	18.0	.8	25.0	-----	-----	749.9
U.S.S.R.	-------	-------	188.9	130.5	27.2	116.3	3,928.0	89.3	194.6	----	87.0	201.0	-----	24.2	4,937.0
Yugoslavia	.1	-------	3.7	35.7	8.1	.6	83.7	6.9	7.0	----	9.4	-----	-----	-----	155.2
Subtotal	77.6	22.4	210.3	568.9	371.7	230.2	6,891.7	237.3	474.8	18.0	278.3	270.7	-----	108.2	9,760.1
Total	4,587.4	1,109.2	1,683.9	14,999.3	5,940.9	3,108.9	8,284.4	2,455.3	1,859.6	24.7	1,843.3	535.4	366.8	115.5	46,414.6
Africa:															
South Africa Republic of	-------	-------	.1	-------	.4	-------	-------	96.3	-------	----	.3	-----	.1	-----	97.2
South Asia and Far East:															
India [7]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	179.0	179.0
Japan	4,122.0	238.0	770.0	160.0	26.0	170.0	275.0	437.0	245.0	XX	2,242.0	260.0	599.0	202.0	9,746.0
Total	4,122.0	238.0	770.0	160.0	26.0	170.0	275.0	437.0	245.0	----	2,242.0	260.0	599.0	381.0	9,925.0
Oceania: Australia	28.0	10.7	13.2	.6	17.0	.3	-------	8.9	4.1	12.1	45.3	1.8	185.5	4.5	332.0
Grand total	9,307.3	1,897.7	3,145.2	15,249.4	6,041.2	3,529.9	8,560.2	3,098.1	2,183.6	44.3	4,333.1	797.3	1,190.5	501.0	59,877.8

NA. Not available. XX Not applicable.

[1] Because of the practice of some countries of not reporting destinations for a portion of exports (see Unallocated column below), figures given for distribution of those countries' exports by continental area are not exactly correct. However, such unallocated quantities are sizable only in the cases of East Germany, U.S.S.R., India and Japan.

[2] All western hemisphere except United States and Canada.

[3] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, U.S.S.R. and Yugoslavia.

[4] Aden, Bahrain, Cyprus, Iran, Iraq, Israel, Jordan, Kuwait, Muscat and Oman, Lebanon, Qatar, Saudi Arabia, Syria, Trucial Oman, Turkey and Yemen.

[5] Mainland China, North Korea and North Viet-Nam; Mongolia included under Other Non-Communist South Asia and Far East because it is inseparable in source.

[6] Source: Statistical Office of the United Nations.

[7] Source: Trade returns of the exporting company.

Source: Except where otherwise noted: United Nations. Economic Commission for Europe. Statistics of World Trade in Steel 1965. New York, 1966, 52 pp.

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Table 41.—Major world trade in steel ingots and semimanufactures in 1966, by areas

(Thousand metric tons)

Exporting country and area	Destinations [1]													
	North America			Europe				Africa	Near East [4]	South Asia and Far East			Oceania	Unallocated [5]	Total
	United States	Canada	Latin America [2]	European Economic Community	European Free Trade Association	Other Non-Communist	Communist [3]			Non-Communist: Japan	Non-Communist: Other	Communist [5]			
North America:															
Canada	555.6	XX	164.1	9.0	20.3	21.9	------	15.9	4.0	(6)	10.8	.3	9.3	-----	811.2
United States	XX	386.4	473.3	92.0	39.2	16.2	2.6	98.3	58.3	5.1	401.7	------	13.7	-----	1,586.8
Total	555.6	386.4	637.4	101.0	59.5	38.1	2.6	114.2	62.3	5.1	412.5	.3	23.0	-----	2,398.0
Europe:															
European Economic Community:															
Belgium-Luxembourg	1,273.0	199.0	329.0	5,193.0	794.0	402.0	93.0	262.0	297.0	1.0	159.0	37.0	12.0	-----	9,051.0
France	723.3	93.7	261.8	2,800.6	934.0	375.1	135.2	546.0	266.6	----	109.0	68.0	15.7	-----	6,329.0
Germany, West	1,098.6	236.9	315.8	4,419.4	1,588.2	706.1	396.4	214.4	325.8	2.6	187.5	157.8	5.8	0.2	9,655.5
Italy	176.4	2.1	73.6	675.6	142.3	140.1	245.7	142.6	271.9	----	42.4	159.3	4.9	49.7	2,126.6
Netherlands	55.7	2.8	44.2	1,181.7	452.7	264.6	22.3	47.2	20.2	.7	29.5	11.0	.4	6.6	2,139.6
Subtotal	3,327.0	534.5	1,024.4	14,270.3	3,911.2	1,887.9	892.6	1,212.2	1,181.5	4.3	527.4	433.1	38.8	56.5	29,301.7
European Free Trade Association:															
Austria	4.0	2.7	13.7	590.2	180.7	31.8	308.8	2.1	43.7	.2	3.6	.1	1.1	4.7	1,187.4
Denmark	------	.1	.1	42.0	100.0	3.0	1.8	.6	1.2	----	------	------	-----	-----	148.8
Norway	13.4	.7	6.4	92.3	208.8	42.6	6.7	2.7	1.4	----	.3	1.3	(6)	.1	376.7
Portugal	.4	.1	(6)	5.8	.3	1.8	------	11.9	4.0	----	.1	------	-----	.2	24.6
Sweden	72.3	12.4	31.2	319.3	406.0	86.8	78.7	8.9	4.1	1.5	14.9	9.9	4.7	-----	1,050.7
Switzerland [7]	8.5	2.4	1.2	58.0	16.7	3.5	.4	1.5	.7	(6)	.4	------	.3	-----	93.6
United Kingdom	123.1	679.5	280.2	357.2	530.4	487.1	108.1	285.1	173.9	2.2	275.6	87.0	179.8	-----	3,569.2
Subtotal	221.7	697.9	332.8	1,464.8	1,442.9	656.6	504.5	312.8	229.0	3.9	294.9	98.3	185.9	5.0	6,451.0
Other Non-Communist Europe:															
Finland	------	------	.6	8.4	20.1	------	.5	------	.1	----	2.0	------	-----	-----	31.7
Greece	------	------	------	9.6	(6)	10.5	2.6	3.0	.5	----	(6)	------	-----	-----	26.2
Spain	.8	------	5.4	14.5	19.2	1.2	.7	4.7	.2	----	(6)	------	-----	.2	46.9
Subtotal	.8	------	6.0	32.5	39.3	11.7	3.8	7.7	.8	----	2.0	------	-----	.2	104.8

See footnotes at end of table.

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Table 41.—Major world trade in steel ingots and semimanufactures in 1966, by areas—Continued

(Thousand metric tons)

Exporting country and area	Destinations [1]														
	North America			Europe				Africa	Near East [4]	South Asia and Far East			Oceania	Unallocated [5]	Total
	United	Canada	Latin America [2]	European Economic Community	European Free Trade Association	Other Non-Communist	Communist [3]			Non-Communist		Communist [5]			
										Japan	Other				
Europe—Continued															
European Communist countries:															
Czechoslovakia	.1	70.9	9.0	271.1	206.8	60.2	1,113.6	51.0	116.9	----	38.1	(6)	.6	-----	1,938.3
Germany, East	-------	------	9.0	9.0	11.0	4.0	125.0	7.0	24.0	----	8.0	4.0	-----	[9] 61.0	262.0
Hungary	-------	------	.6	110.4	73.0	33.0	302.5	22.7	105.6	----	25.6	6.7	-----	-----	680.1
Poland	83.3	12.9	56.2	27.2	124.5	46.1	537.7	30.5	59.6	----	76.7	------	-----	-----	1,054.7
Rumania	-------	------	------	148.0	11.3	------	656.5	2.1	70.8	----	(6)	23.6	-----	-----	912.3
U.S.S.R	-------	------	162.7	35.3	74.5	173.3	3,487.3	50.5	235.6	----	120.8	63.6	-----	6.4	4,410.0
Yugoslavia	1.3	------	1.8	56.6	11.0	(6)	155.8	1.5	5.1	----	9.2	------	-----	.1	242.4
Subtotal	84.7	83.8	239.3	657.6	512.1	316.6	6,378.4	165.3	617.6	----	278.4	97.9	.6	67.5	9,499.8
Total	3,634.2	1,316.2	1,602.5	16,425.2	5,905.5	2,872.8	7,779.3	1,698.0	2,028.9	8.2	1,102.7	629.3	225.3	129.2	45,357.3
Africa: South Africa, Republic of	47.5	(6)	.2	.3	10.2	.1	------	------	------	(6)	.1	------	1.6	138.7	198.7
South Asia and Far East:															
India	10.5	------	-----	-------	1.1	------	11.8	34.1	100.0	4.5	99.5	------	2.2	-----	263.7
Japan	4,416.9	233.5	638.7	268.1	15.4	110.6	248.2	219.7	220.6	XX	2,202.7	664.0	240.0	(6)	9,478.4
Total	4,427.4	233.5	638.7	268.1	16.5	110.6	260.0	253.8	320.6	4.5	2,302.2	664.0	242.2	(6)	9,742.1
Oceania: Australia	43.7	26.1	19.0	23.4	33.1	32.3	------	3.3	0.4	15.4	107.1	5.7	244.9	5.8	560.2
Grand total	8,708.4	1,962.2	2,897.8	16,818.0	6,024.8	3,053.9	8,041.9	2,069.3	2,412.2	33.2	3,924.6	1,299.3	737.0	273.7	58,256.3

XX Not applicable.

[1] Because of the practice of some countries of not reporting destinations for a portion of exports (see Unallocated column below), figures given for distribution of those countries' exports by continental area are not exactly correct. However, such unallocated quantities are sizable only in the cases of Italy, East Germany, and the Republic of South Africa.

[2] All western hemisphere areas except United States and Canada.

[3] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, U.S.S.R., and Yugoslavia.

[4] Aden, Bahrain, Cyprus, Iran, Iraq, Israel, Jordan, Kuwait, Muscat and Oman, Lebanon, Qatar, Saudi Arabia, Syria, Trucial Oman, Turkey, and Yemen.

[5] Mainland China, North Korea and North Viet-Nam; Mongolia included under Other non-Communist South Asia and Far East because it is inseparable in source.

[6] Less than 50 tons.

[7] Source: Trade returns of the exporting company.

[8] Included with Communist Europe.

[9] All non-Communist Europe, otherwise unspecified.

Source: Except where otherwise noted: United Nations. Economic Commission for Europe. Statistics of World Trade in Steel 1966. New York, 1967, 61 pp.

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Table 42.—World trade of lead ores and concentrates [1]

(Thousand metric tons of contained metal unless otherwise specified)

Destination	Exporting regions								
	North America [2]	Latin America [2]	Western Europe [3]	Eastern Europe [3]	Africa	Asia	Oceania	Origin not reported by continent	Total
1965:									
United States	21.7	25.2	---	---	1.1	---	13.6	---	61.6
Western Europe:									
Belgium-Luxembourg [4]	10.6	.4	2.7	---	18.3	---	---	3.1	35.1
France	1.5	.7	7.6	---	20.4	0.5	10.5	---	41.2
Germany, West	10.3	11.0	23.1	5.4	6.6	2.7	---	---	59.1
United Kingdom	4.3	---	---	---	---	.1	4.4	3.0	11.8
Other [5]	---	---	.9	---	5.3	---	---	---	6.2
Total [6]	26.7	12.1	34.3	5.4	50.6	3.3	14.9	6.1	153.4
Japan	---	2.7	---	---	---	4.1	10.6	---	17.4
Grand total	48.4	40.0	34.3	5.4	51.7	7.4	39.1	6.1	232.4
1966:									
United States	49.1	58.9	1.9	---	1.3	.1	20.5	.2	132.0
Western Europe:									
Belgium-Luxembourg [7]	53.7	.4	9.3	---	72.1	---	---	8.6	144.1
France	1.5	7.3	17.5	---	35.1	.5	18.9	---	80.8
Germany, West	22.0	16.7	42.4	9.8	11.7	4.0	.3	---	106.9
United Kingdom	5.1	---	---	---	---	.3	8.1	8.8	22.3
Other [5]	---	---	6.0	---	16.0	---	---	.1	22.1
Total [6]	82.3	24.4	75.2	9.8	134.9	4.8	27.3	17.5	376.2
Japan	17.2	5.1	---	---	---	7.1	16.3	---	45.7
Grand total	148.6	88.4	77.1	9.8	136.2	12.0	64.1	17.7	553.9

[1] Compiled from import data of countries listed in destination column only, therefore incomplete; however imports by countries not listed are regarded as being relatively small with respect to total.
[2] Mexico included with Latin America.
[3] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania and U.S.S.R.; Yugoslavia is included with Western Europe.
[4] Data are for gross weight of ores and concentrates rather than contained metal, and cover January through October only.
[5] Austria and Italy.
[6] Data are for gross weight of ores and concentrates rather than contained metal, and cover January through April only.
[7] Total of listed figures, including gross weight of ores and concentrates for Belgium-Luxembourg and contained metal weight for all other countries.

Source: International Lead and Zinc Study Group. Lead and Zinc Statistics. v. 6, No. 11, November 1966, p. 24 and v. 7, No. 5, May 1967, p. 24.

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Table 43.—World trade of zinc ores and concentrates [1]

(Thousand metric tons of contained metal unless otherwise specified)

Destination	Exporting regions								
	North America [2]	Latin America [2]	Western Europe [3]	Eastern Europe [3]	Africa	Asia	Oceania	Origin not reported by continent	Total
1965:									
United States	93.9	92.6	---	---	9.7	---	1.9	0.3	198.4
Western Europe:									
Belgium-Luxembourg [4]	64.6	---	---	---	29.3	---	9.0	27.5	130.4
France	21.4	11.9	31.8	---	37.8	3.2	4.2	---	110.3
Germany, West	5.3	4.0	10.3	0.8	4.1	3.7	---	---	28.2
United Kingdom	5.3	---	---	---	---	1.0	42.5	6.2	55.0
Other [5]	1.2	.6	19.1	---	2.5	.4	3.4	.2	27.4
Total [6]	97.8	16.5	61.2	.8	73.7	8.3	59.1	33.9	351.3
Japan	2.6	77.3	---	---	---	13.5	9.0	.5	102.9
Grand total [6]	194.3	186.4	61.2	.8	83.4	21.8	70.0	34.7	652.6
1966:									
United States	247.6	190.4	12.8	---	18.2	(7)	3.9	---	472.9
Western Europe:									
Belgium-Luxembourg [4]	237.1	---	83.9	---	70.8	---	24.2	56.2	472.2
France	44.0	22.5	61.7	---	62.9	7.1	4.2	---	202.4
Germany, West	27.6	8.5	30.6	1.2	7.6	5.4	---	---	80.9
United Kingdom	6.8	.1	---	---	---	3.5	84.3	17.5	112.2
Other [5]	16.3	1.0	66.2	---	3.9	1.4	8.1	---	96.9
Total [6]	331.8	32.1	242.4	1.2	145.2	17.4	120.8	73.7	964.6
Japan	16.5	169.8	---	---	---	25.0	20.5	---	231 8
Grand total [6]	595.9	392.3	255.2	1.2	163.4	42.4	145.2	73.7	1,669.3

[1] Compiled from import data of countries listed in destination column only, therefore incomplete; however, imports by countries not listed are regarded as being relatively small with respect to total.
[2] Mexico included with Latin America.
[3] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and U.S.S.R., Yugoslavia is included with Western Europe.
[4] Data are per gross weight of ore and concentrates rather than for contained metal, and cover January through April only.
[5] Austria, Netherlands, and Norway.
[6] Total of listed figures, including gross weight of ores and concentrates for Belgium-Luxembourg and contained metal weight for all other countries.
[7] Less than 50 tons.

Source: International Lead and Zinc Study Group. Lead and Zinc Statistics. v. 6, No. 11, November 1966, p. 25, and v. 7, No. 5, May 1967, p. 25.

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Table 44.—World movement of solid fuels [1]

(Thousand metric tons, standard coal equivalent)

Destinations	Exporting regions						
	North America	Western Europe	Africa	Far East	Oceania	Other countries [2]	Total [3]
1965:							
North America	15,540	15	----	----	----	----	15,550
Caribbean America	250	130	----	----	----	130	510
Other America	1,840	150	----	----	----	140	2,130
Western Europe	22,600	36,380	540	----	----	21,800	81,330
Africa	5	80	2,430	----	----	500	3,010
Near East	----	20	----	----	----	----	20
Far East	7,760	55	340	1,250	6,990	2,650	19,050
Oceania	5	20	15	----	310	----	350
Other countries [2]	210	450	----	----	----	35,890	36,560
Total [3]	48,230	37,430	3,340	1,250	7,330	61,220	158,810
1966:							
North America	15,830	----	----	----	----	----	15,830
Caribbean America	300	100	----	----	----	110	530
Other America	2,410	100	----	----	----	250	2,760
Western Europe	20,710	34,800	310	----	----	21,430	77,260
Africa	15	110	1,970	----	----	420	2,520
Near East	----	10	----	----	----	----	10
Far East	8,060	260	250	580	7,990	4,060	21,190
Oceania	15	----	10	15	380	----	420
Other countries [2]	230	310	----	----	----	36,030	36,560
Total [3]	47,610	35,770	2,660	600	8,380	62,320	157,340

[1] Data based on general trade system (including reexports among exports). Lignite, lignite briquets and coke are reduced to standard coal equivalent. Bunker loadings excluded.

[2] Includes Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and U.S.S.R. among others.

[3] Reported totals, details do not add to listed totals because of inclusion in totals of quantities shipped to or received from areas not listed separately.

Source: Statistical Office of the United Nations. World Energy Supplies 1963–66, Series J, No. 11, New York 1968, pp. 40–45.

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Table 45.—World movement of crude petroleum [1]

(Thousand metric tons)

Destinations	Exporting regions								
	North America	Caribbean America [2]	Other America [2]	Western Europe	Africa [3]	Near East [3]	Far East	Other countries [4]	World [7]
1965:									
North America	14,590	39,440	----------	----------	3,580	23,230	3,030	----------	83,870
Caribbean America [2]	45	59,270	----------	----------	15	4,550	----------	3,510	67,395
Other America [2]	--------	6,590	290	----------	880	5,920	----------	2,760	16,415
Western Europe	50	24,230	125	445	92,250	192,680	160	14,730	324,630
Africa [3]	--------	----------	----------	----------	2,210	11,160	----------	1,700	15,070
Near East [3]	--------	----------	----------	----------	----------	23,480	----------	----------	23,480
Far East	40	450	30	----------	----------	83,000	11,430	2,460	97,410
Oceania	--------	----------	----------	----------	----------	13,570	4,890	----------	18,460
Other [5]	--------	----------	----------	----------	285	[6] 770	----------	18,600	19,660
World [7]	14,730	129,970	450	450	99,220	358,350	19,510	43,720	666,390
1966:									
North America	16,710	36,010	160	----------	6,830	21,610	2,460	----------	83,780
Caribbean America [2]	30	60,660	----------	----------	710	3,800	----------	3,840	69,040
Other America [2]	--------	6,180	230	----------	2,450	7,400	----------	2,210	18,480
Western Europe	60	22,750	140	720	113,600	219,310	250	18,210	375,040
Africa [3]	--------	----------	----------	----------	1,760	12,990	----------	2,090	16,840
Near East [3]	--------	----------	----------	----------	490	23,720	----------	----------	24,210
Far East	110	480	20	----------	----------	98,960	12,230	3,000	114,800
Oceania	--------	30	----------	----------	80	15,290	4,840	----------	20,240
Other [5]	--------	----------	----------	30	680	[6] 1,830	----------	21,260	23,920
World [7]	16,910	126,110	550	750	126,720	404,910	19,780	50,620	746,360

[1] Data based on general trade system (Reexports included with exports).
[2] Colombia and Venezuela are included with Caribbean America rather than with Other America.
[3] Libya, Sudan and United Arab Republic, formerly included under Near East in both the source publication and in proceeding editions of this table in Minerals Yearbook, V. IV, are included in Africa in this table; thus data are not comparable to that in previous editions of the Minerals Yearbook.
[4] Almost entirely from the U.S.S.R.
[5] Chiefly Bulgaria, Czechoslovakia, East Germany, Hungary and Poland, although other countries, not identified in source, are also included.
[6] Reported in source not as shipments to other countries, but as shipments to unspecified destinations.
[7] Reported totals, details do not add to listed totals because of inclusion in totals of data for other areas not listed separately.

Source: Statistical Office of the United Nations. World Energy Supplies 1963–66, Series J., No. 11, New York, 1968, pp. 76–83.

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Table 46.—Refined petroleum fuel trade by continental areas [1]

(Million metric tons)

Continental areas	1965			1966		
	Exports	Imports	Bunkers	Exports	Imports	Bunkers
North America	5.53	67.87	14.72	5.72	73.62	16.06
Caribbean America [2]	105.41	11.75	12.80	105.59	11.60	12.68
Other America	1.06	4.42	1.46	1.32	4.28	1.36
Western Europe	57.46	97.33	34.45	67.48	108.52	36.10
Africa [3]	5.34	11.92	6.35	4.75	10.84	6.30
Near East [3]	45.05	2.37	15.15	47.79	2.51	15.92
Far East	13.04	30.93	16.81	16.10	32.34	18.13
Oceania	1.24	2.90	2.43	1.37	3.05	3.02
Other [4]	29.72	7.18	NA	31.67	6.93	NA
World [5]	263.86	236.66	104.21	281.79	253.66	109.60

NA Not available.

[1] The apparent discrepancy between export, import and bunker totals is evidently largely the result of practices regarding reporting of bunkering materials. Many areas do not record the import of liquid fuels destined for international bunkers, and virtually without exception, bunker loadings are not counted among the imports of the nation to which the vessel receiving the bunker loading belongs.

[2] Colombia and Venezuela are included in Caribbean America rather than Other America.

[3] Libya, Sudan and United Arab Republic are included in Africa rather than Near East. This departs from previous practice in source publication.

[4] Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania and U.S.S.R.

[5] Reported totals; details do not add because of rounding.

Source: Statistical Office of the United Nations. World Energy Supplies 1963–66. Series J., No. 11, New York, 1968, pp. 56–75.

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The Mineral Industry of Algeria

By Henry E. Stipp [1] and Eugene R. Slatick [2]

The petroleum sector of Algeria's mineral industry continued to make progress in 1967, while the metals and nonmetals division remained in a depressed condition. An embargo on exports from Algeria to United States, United Kingdom, and West Germany from June through early September added to the generally depressed condition of the mineral industry.

Government revenue from petroleum in 1967 was reported at $200 million compared with $140 million in 1966.[3] This represented the major part of proceeds received from the entire mineral industry and probably accounted for the largest part of income derived from all sources.

Government control of the nation's mineral industry increased in 1967. All privately owned mines had been nationalized in 1966, and in 1967 nationalization was extended to several oil refining and marketing operations owned by United States firms. In addition the operations of petroleum producing companies owned by United States and United Kingdom based organizations were placed under Algerian Government supervision.

In May, the Algerian mining agency Bureau Algérien de Recherches et d'Exploitations Minières (BAREM) was dissolved and replaced by an autonomous national mining company, Société Nationale de Recherches et d'Exploitations Minières (SONAREM). All nationalized mines were placed under the administrative control of SONAREM.

Studies were completed in October for construction of a school for mining and metallurgy to be built by Soviet engineers at Annaba.

PRODUCTION

In 1967, Algeria was trying to attain prior production levels in the privately owned mines that were nationalized in May 1966. By yearend iron ore production was rising rapidly to prenationalization levels, but there was little improvement in lead and zinc output. Mineral production from previously nationalized mines and privately owned quarries generally was at normal levels. Phosphate rock output was estimated to have increased substantially, owing to the opening of mining operations at the Djebel Onk deposit.

Crude oil production, second to that of Libya in Africa, was almost 10 percent higher than that of 1966. Liquefied natural gas output in 1967 was believed to be about on a par with that of 1966, while petroleum refinery output was estimated to have increased about 26 percent.

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[1] Physical scientist, Division of International Activities.
[2] Foreign mineral specialist (Petroleum), Division of International Activities.
[3] Petroleum Intelligence Weekly, June 5, 1967, p. 8.

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Table 1.—Algeria: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966 [2]	1967 [3]
Metals:					
Aluminum:					
Unwrought	157	r 150	e 150	150	150
Semimanufactures, including alloys	261	r 200	e 215	230	230
Antimony:					
Concentrate	-------	-------	200	200	200
Metal content	-------	-------	64	64	64
Copper:					
Concentrate	3,745	3,900	3,660	3,600	4,000
Metal content	1,036	1,092	1,025	972	1,080
Refined, including alloys	1,370	473	r 400	2,000	2,000
Iron and steel:					
Iron ore—thousand tons	1,976	2,739	3,132	1,700	2,000
Pig iron	3,462	3,629	NA	11,000	12,000
Ingots and equivalent forms	9,480	19,792	NA	16,000	17,000
Semimanufactures	17,194	26,149	NA	27,000	27,500
Lead:					
Concentrate	11,763	13,602	14,922	r 6,000	6,000
Metal content	8,020	9,548	10,445	r 4,000	4,000
Refined, including alloys	1,280	1,393	1,200	1,125	1,125
Silver [4]—thousand troy ounces	255	295	295	420	420
Zinc:					
Concentrate—thousand tons	58	64	63	24	24
Metal content—do	36	35	38	12	12
Other [5]	60	81	NA	NA	NA
Nonmetals:					
Barite	29,412	29,633	42,767	75,000	80,000
Cement—thousand tons	884	785	739	659	670
Clay, bentonitic	16,256	15,000	NA	20,000	20,000
Diatomite	17,648	20,106	16,413	16,400	16,400
Fertilizer materials:					
Phosphate rock—thousand tons	348	73	86	80	350
Superphosphate—do	52	88	NA	78	78
Other—do	2,171	2,000	NA	50,000	50,000
Fuller's earth	81,608	52,923	59,895	60,000	60,000
Gypsum—thousand tons	175	175	175	175	175
Lime—do	19	28	NA	18	20
Pigments, mineral—do	6	6	NA	NA	NA
Pyrite—do	38	61	57	50	60
Salt—do	124	116	116	116	117
Stone, dimension—thousand square meters	r 800	r 800	r 800	800	800
Mineral fuels:					
Coal—thousand tons	38	46	45	r 50	50
Coke (low temperature)—do	60	40	35	r 25	25
Natural gas, marketed—million cubic feet	14,902	29,994	65,038	r 72,272	77,608
Liquefied natural gas—thousand 42-gallon barrels	-------	1,082	9,272	11,214	11,000
Natural gas liquids (condensate)—do	2,094	2,243	3,965	5,255	5,600
Petroleum:					
Crude—do	184,288	204,711	201,754	257,122	282,200
Refinery products: [6]					
Gasoline—do	-------	2,771	3,553	3,290	4,110
Kerosine and jet fuel—do	-------	1,168	1,530	1,373	1,644
Distillate fuel oil—do	-------	3,342	3,984	3,529	4,521
Residual fuel oil—do	-------	1,858	2,298	1,945	2,603
Liquefied petroleum gas—do	-------	448	767	743	822
Total—do	-------	9,587	12,132	10,880	13,700

e Estimated. r Revised. NA Not available.

[1] In addition to commodities listed, Algeria produces other construction materials, but data on output are not available.

[2] All data estimated except for antimony concentrate and metal content.

[3] All data estimated.

[4] Estimated recoverable silver content of lead and zinc concentrates.

[5] Undifferentiated metals produced in smelters.

[6] Output from Algiers refinery; excludes output from Hassi Messaoud topping plant.

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TRADE

Official Algerian import data were not available for 1966 but exports to Algeria from the European Common Market were presented. Algerian export data for 1966 were available only for the first 9 months. Mineral commodity exports in 1965 were valued at approximately $500 million out of total commodity exports of $740 million. Mineral export values in 1966 apparently approximated those of 1965.

Import values in 1966 from the Common Market only probably exceeded the $51.5 million from those countries in 1965. Total commodity imports from the Common Market were valued at $636.8 million in 1965.

Table 2.—Algeria: Selected exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal destinations, 1966
Metals:			
Aluminum, scrap	159	NA	
Copper:			
Ore and concentrate. thousand tons	r 3,930	1,551	All to West Germany.
Metal, all forms	1,982	NA	
Iron and steel:			
Ore and concentrate. thousand tons	[3] 2,993	1,600	United Kindgom 622; Italy 568; Bulgaria 203.
Scrap do	18	NA	
Lead:			
Concentrate	[3] 12,796	8,342	Spain 2,702; Morocco 1,965; Italy 1,771.
Scrap	--------	NA	
Zinc:			
Concentrate	[3] 67,673	15,000	France 9,219; Spain 1,920; West Germany 1,600.
Scrap	--------	NA	
Nonmetals:			
Abrasives	1,775	NA	
Barite	r 6,104	9,500	Nigeria 7,000; Bahrein 1,480.
Cement thousand tons	132	NA	
Diatomite	[3] 10,450	7,164	NA.
Fuller's earth	[3] 13,610	11,636	France 10,148; Morocco 1,488.
Phosphate rock thousand tons	r 62	13	France 7; West Germany 4; Turkey 2.
Pyrite	[3] 35,880	30,425	Italy 25,000; Bulgaria 2,800.
Salt	39,756	NA	
Mineral fuels:			
Liquefied natural gas. thousand 42-gallon barrels	9,272	11,214	United Kingdom 7,255; France 3,959.
Petroleum:			
Crude do	189,195	e 244,000	France 147,935; West Germany 35,233.
Refinery products:			
Gasoline do	[4] 856	[5] 61	All to France.
Kerosine and jet fuel do	[4] 229	[5] 47	All to Spain.
Distillate fuel oil do	[4] 2,536	[5] 305	Netherlands 244; France 61.
Residual fuel oil do	[4] 819	[5] 146	France 139; Netherlands 7.
Liquefied petroleum gas (LPG) and other. do	[4] 236	[5] 292	All to France.
Total do	[4] 4,676	[5] 851	

e Estimate. r Revised. NA Not Available.

[1] Supplement to the World Trade Annual, Africa. V. 3, 1965, pp. 707–712.

[2] Bulletin de Statistiques Generales (Algiers), No. 1, 1967, pp. 52–56 (Lists exports for first 9 months of 1966).

[3] Industrie Miniere Expose Sur la Situation Generale de l'Algerie, 1965.

[4] To France only; probably includes products previously imported in bond from France.

[5] May include some products previously imported in bond.

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Table 3.—Algeria: Selected imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals: [2]			
Alumina	153	-------	
Aluminum	1,563	710	France 649; Belgium-Luxembourg 61.
Bauxite	7,000	4,000	All from France.
Copper	884	2,427	France 2,404; Italy 17.
Iron and steel:			
Pig iron and ferroalloys	563	660	France 391; United Kingdom 269.
Blooms, billets, and slabs	1,417	6,530	West Germany 3,845; Belgium-Luxembourg 1,958.
Semimanufactures	156,699	111,452	France 103,056; West Germany 5,069; Belgium-Luxembourg 2,956.
Lead:			
Metal	837	988	All from France.
Oxide	150	89	Do.
Silver----thousand troy ounces	35	e 29	Do.
Tin----long tons	44	40	Do.
Titanium oxide	266	183	France 123; Italy 60.
Zinc:			
Metal	459	556	France 369; Belgium-Luxembourg 187.
Oxide	235	219	All from France.
Nonmetals:			
Asbestos	1,823	1,036	All from France.
Cement	10,233	10,366	All from France.
Chalk	3,678	3,946	Do.
Clays	5,390	3,800	United Kingdom 2,983; France 817.
Clay construction materials	14,226	4,564	France 4,163; Italy 232; West Germany 169.
Dolomite	-------	971	All from France.
Fertilizers:			
Nitrogenous	76,863	60,515	France 54,081; Italy 5,939.
Phosphatic	3,590	2,550	All from France.
Potassic	38,790	14,588	Italy 6,570; France 3,531; Belgium-Luxembourg 3,487.
Other	1,253	1,018	Italy 700; France 318.
Lime	3,404	2,474	All from France.
Pigments, mineral	503	354	Do.
Quartz and quartzite	500	-------	
Salt	101	57	All from France.
Sulfur, crude and refined	34,545	33,840	All from France.
Talc	6,604	1,817	Do.
Mineral fuels:			
Coal	12,858	10,692	All from France.
Coke and semicoke	9,554	11,210	Do.
Petroleum refinery products:			
Gasoline----thousand 42-gallon barrels	138	276	France 149; Netherlands Antilles 127.
Kerosine and jet fuel----do	13	-------	
Distillate fuel oil----do	29	24	All from France.
Residual fuel oil----do	39	31	Do.
Lubricants----do	222	192	Do.
Liquefied petroleum gas----do	26	24	Do.
Asphalt and other----do	306	214	Do.
Total----do	773	761	

[1] Selected imports from France, Italy, United Kingdom, West Germany, Belgium-Luxembourg only except for gasoline, in which case data for Netherlands Antilles are included.
[2] Includes unwrought metal, semimanufactures, and scrap, unless otherwise specified.

COMMODITY REVIEW

METALS

Antimony.—Algeria's only producing mine at Hamman N' Bails was nationalized in May 1966. Production statistics for 1967 were not available, but output probably was close to 1966 levels. Exports for 9 months of 1966 totaled 250 tons (mined prior to nationalization).

Copper.—Production of concentrate at the Ain Barber mine, Algeria's only copper producer, was restricted by marketing difficulties. The termination of sales contracts following nationalization led to a decrease in 1966 exports. In March 1967, however, 3,500 tons reportedly were shipped to Japan indicating that production

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in 1967 could increase somewhat. At yearend, the Government mining company Société Nationale de Recherche at d'Exploitation Minière (SONAREM) and the Japanese firm Kinsho Matoishi signed a contract for the export of 4,500 tons of concentrate to Japan.[4]

Iron Ore.—Statistical data on 1967 iron ore industry activity were not available, and data for 1966 were incomplete. An indicated decline in 1966 exports was attributed to nationalization of the Ouenza-Boukhadra mine complex which normally contributed about 85 percent of national production. Iron ore production and exports from the previously nationalized mines such as Beni Saf were at normal levels in 1966. By the beginning of 1967 Italy, Belgium, Great Britain, and Spain concluded new contracts for purchase of iron ore. Communist countries also agreed to purchase increased quantities of ore during 1967. Rumania contracted for 500,000 tons of iron ore in payment for a shipment of petroleum equipment to SONATRACH, the Algerian state petroleum company. U.S.S.R. reportedly was to receive 600,000 tons of ore in 1967, which would make her Algeria's third largest customer after Great Britain and Italy. At yearend SONAREM sold 250,000 tons of ore from the Ouenza mine to Nippon Kokan K.K. and Sumitomo Metal Industries Ltd. of Japan.[5]

Specialists from Czechozlovakia were investigating the size of the iron ore deposit at Gara Djebilet near Tindouf.[6] Reserves were considered to be 3 million tons of ore containing 50 to 55 percent iron. Twenty-one Russian specialists provided technical aid for open pit mining at the Ouenza deposit. Algeria and Spain were studying development of the iron ore deposits in the Tindouf Basin.[7] Exploitation of these deposits depends upon finding an economic transportation route to an ocean port.

Iron and Steel.—U.S.S.R. granted a credit valued at $128 million to Algeria for construction of a steel mill at Annaba.[8] France also was to participate in building the mill. Algeria agreed to purchase 40,000 tons of steel pipe from the Japanese firms Nippon Kokan K.K. and Sumitomo for a natural gas line between Hassi-R'mel and Skikda.[9] Société Nationale de Siderurgie and Hoesch Export of Germany were scheduled to build a plant to manufacture 16- to 42-inch steel pipe at the El Hadjar steel works at Annaba.[10]

Lead and Zinc.—The principal reason for the sharp drop in 1966 and 1967 lead and zinc concentrate production and exports relative to that of preceding years was the crucial role of the flotation plant at the El Abed-Oued Zounder mine. This facility for treating ore is across the national border in Morocco and access to the plant was prohibited after nationalization of the mine. In order to increase lead and zinc concentrate production to previous levels, the Government decided to construct a flotation plant on Algerian territory, which in August 1966, the Soviet Government reportedly agreed to build. Production of zinc concentrate from calamine at the Ouarsenis mine, which was not dependent upon flotation installations, was estimated at 5,000 tons in 1966, about 28 percent less than that of 1965. This decline was attributed solely to nationalization.

A lead flotation plant being constructed at the Djebel Gustar mine reportedly began operating in May. A roasting plant to process slag from previous operations also was being constructed and was expected to begin operating at yearend 1967. The mines at Djebel Gustar southeast of Sétif, where Yugoslavian geologists reportedly found reserves of 400,000 tons of ore, were being reopened and production was expected to begin in 1968. The Yugoslav mining specialists also were scheduled to supervise reopening of the Kherset Youssef lead and zinc mine.

Mercury.—The mercury mines of Ras El Ma and M'Rasma near Skikda closed in 1945 because of the declining ore grade, were scheduled to be reopened with cooperation of a Soviet geological mission. Prospecting by Soviet geologists reportedly located a large deposit at Ismail containing ore with 0.7 percent mercury.

NONMETALS

Barite.—Increased oil drilling activity in Nigeria and Bahrein accounted for the 55 percent rise in barite exports in 1966, and

[4] World Mining, V. 3, No. 11, October 1967, p. 57.
[5] Engineering and Mining Journal. V. 169, No. 1, January 1968, p. 148.
[6] Metal Bulletin (London). No. 5159, Dec. 23, 1966, p. 14.
[7] Metals Week. V. 38, No. 13, Mar. 17, 1967, p. 6.
[8] World Mining. V. 3, No. 2, February 1967, p. 46.
[9] Source cited in footnote 5.
[10] Oil and Gas Journal. V. 65, No. 45, Nov. 6, 1967, p. 70.

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this trend probably continued in 1967 in view of the increased oil drilling activity along the Atlantic coast of Africa, in Libya, and in Near East countries.

Fertilizer Materials.—Production of phosphate rock was believed to have increased sharply in 1967 as the result of operations at the new Djebel Onk quarry that started in early 1967. This deposit near Bir el Ater contains estimated reserves of 500 million tons of phosphate rock averaging 33 percent phosphorus pentoxide (P_2O_5). According to an ordinance of May 19, 1967, SONAREM, the national mining company, acquired 50-percent participation in Société du Djebel Onk. At yearend this participation was raised to 66.6 percent as a result of negotiations between SONAREM and the French company Caisse d'Equipment pour le Développement in Algérie parent firm of Société du Djebel Onk.

Production of phosphate in 1966 was entirely from the El Kouif mine near Tebessa, which was essentially worked out by yearend. Most of the phosphate rock produced from this mine was used by domestic fertilizer plants, which produced 64,211 tons of superphosphate in the first 10 months of 1966. Exports of phosphate rock were reduced substantially in 1966, but in 1967 presumably increased sharply as a result of production from the newly opened Djebel Onk deposit.

Algeria imported large quantities of nitrogenous and potassic fertilizers from Europe principally France; however, a number of plants were being constructed at Arzew, which are expected to provide approximately 2,530 tons daily of nitrogenous fertilizers and chemicals by 1969.

Pyrite.—Production at Algeria's only active mine near Skikda was estimated at 60,000 tons up somwhat from output in 1966. In May 1967 Yugoslavia mining specialists agreed to supervise construction of a washing plant and the reopening of the El Ahlia mine.[11]

MINERAL FUELS

Coal.—During 1967, SONAREM, continued studies regarding the possibility of building a coke plant in the Kenedza coal fields. The plant would supply coke to the steel complex being built at Annaba.

Petroleum.—Algeria's proved crude oil reserves in 1967 were estimated at 6.9 billion barrels,[12] compared with 6.3 billion barrels at the end of 1965. They ranked second in Africa after those of Libya and accounted for 1.7 percent of the world's total.

Daily output of crude oil in 1967 was about 773,000 barrels, compared with 704,000 barrels in 1966. In mid-1967, 701 wells were producing (668 flowing, 33 pumping), and 115 wells were shut in.[13]

The major producing companies and their share of 1967 output were Compagnie de Recherches et d'Exploitation du Pétrole au Sahara (CREPS), 24.6 percent; Société Nationale de Recherche et d'Exploration des Petroles en Algéria (SNRepal), 23.9 percent; and Compagnie Française des Petroles (Algérie) (CFPA), 19.8 percent.

Preliminary data indicate that the major oilfields in 1967 were the same as those of 1966. Those fields, the operating companies, and the field's share of 1966 output were Hassi Messaoud (CFPA and SNRepal), 45 percent; Zarzaitine (CREPS), 11 percent; Rhourde el Baguel (Compagnie Pétrolière Saharienne de Sinclair), 10 percent; and Gassi Touil (Compagnie des Pétroles France-Afrique—COPEFA—and Compagnie des Pétroles d'Algéria—CPA), 10 percent.

During the Arab-Israeli War the Algerian Government placed United States and British companies in Algeria under state supervision, and this remained in force through yearend. An embargo on exports to the United States, United Kingdom, and West Germany was in effect from June through early September.

Non-French petroleum companies producing in Algeria were informed by the Government that, for tax purposes, the base price of crude oil was to be raised by 15¢ to 19¢ per barrel. The new prices range from $2.32 to $2.40 per barrel, depending on the export terminal and are 28¢ to 30¢ per barrel higher than those paid by French companies, whose base price ranges from $2.04 to $2.095, as stipulated by the 1965 Franco-Algerian oil pact.[14]

In June, Shell-controlled (65 percent) CPA became the first non-French company

[11] Quarterly Economic Review (London). Algeria. The Economist Intelligence Unit, No. 3, July 1967 p. 5.
[12] Oil and Gas Journal. V. 65, No. 52, Dec. 25, 1967, p. 119
[13] Pages 123–124 of work source cited in footnote 12.
[14] Petroleum Intelligence Weekly. June 12, 1967, p. 5.

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to accept concession areas included in the 1965 Franco-Algerian oil pact. The concessions are Hassi Chergui West, which is held solely by CPA, and Gassi Touil East, Acheb, and Alrar West, all three of which are held jointly by CPA and CREPS. The latter company is owned by Shell (35 percent) and several French companies (65 percent). In addition, CPA and CREPS received jointly two gas concessions, Brides and Toual, that were not included in the 1965 pact.[15]

Near yearend the state-owned petroleum company, Société Nationale pour la Recherche, la Production, la Transport, la Transformation, et la Commercialization des Hydrocarbures (SONATRACH), was granted 10 new exploration permits, covering 24,552 square kilometers, in north central and eastern Sahara. All but one are outside the cooperative zone.

During 1967 SONATRACH received two drilling rigs from the U.S.S.R. and two from Rumania. The Soviet rigs were to be used at El Borma and In Amenas. Reportedly, several more rigs from both countries would follow. More than 200 Russian technicians assisted SONATRACH in various oil operations.[16]

SONATRACH formed an engineering subsidiary, Entreprises Algeriennes de Grands Travaux (ALTRA) with the French firm Union Industrielle de d'Entreprise. SONATRACH has a 51 percent interest in the venture, the same as it has in the two joint ventures formed in 1966 with U.S. companies (ALGEO, a geophysical company, with Independex International of Houston; and ALFOR, a drilling company, with Southeastern Drilling of Dallas).[17]

During the year SONATRACH concluded crude oil export agreements with Brazil, Morocco, and West Germany and also carried on a drive to market Algerian petroleum products in Europe capitalizing on Algeria's associate membership in the Common Market.[18]

Exploration and Development.—The two oil discoveries reported in 1967 were by SONATRACH and Sinclair. The former's discovery, El Borma, is in border territory under dispute with Tunisia. Sinclair's discovery, not yet proved commercial, Mesdar II, is about 24 kilometers southwest of the company's Rhourde el Baguel field. The productive zone, a sand, is at a depth of 11,000 feet.

During the year the Berkaoui field, a 1966 discovery, began production. It is the first field to start operations under terms of the 1965 Franco-Algerian oil agreement, which set up a joint company, Association Cooperative (ASCOP), to operate in Algeria. The field is being developed by SONATRACH and CFPA.

Nuclear devices were being considered as a means of fracturing the reservoir rock in the Hassi Messaoud field in order to maintain or increase production. Tests of fracturing with water and water mixed with gas continued during the year.

Transportation.—In 1967 Algeria's crude oil pipelines totaled about 3,700 kilometers and had a throughput capacity of more than 1.8 million barrels per day. The totals include 510 kilometers of line that cross Tunisia.

The capacity of the Hassi Messaoud-Arzew line was increased to 440,000 barrels per day by means of a $7 million loan from Kuwait's fund for Arab economic development.

During 1967 SONATRACH awarded a contract to Snam Progetti to supervise construction of a 36-inch line from the Mesdar area (about 96 kilometers southeast of Hassi Messaoud) to Skikda. The line, about 706 kilometers long will have a maximum capacity of 600,000 barrels per day. A 322-kilometer, 16-inch line will be built from the El Borma field to the Mesdar-Skikda line. These lines are expected to be completed in early 1970.

Also planned was a 180-kilometer, 16-inch branch line from the Hassi Messaoud-Bougie line at Beni Mansour to the Algiers refinery, intended to eliminate coastal transshipment of crude oil from Bougie to the refinery.

Refining and Marketing.—Refining operations during 1967 were estimated to have increased over the previous years. The output pattern presumably was the same as in the past, mainly gasoline and distillate fuel oil. There were no further developments regarding past proposals to build a second refinery at Arzew.

During the year the Government appointed a committee to negotiate refining and marketing problems. The move stems

[15] Petroleum Intelligence Weekly. June 26, 1967, pp. 8–9.
[16] Petroleum Intelligence Weekly. Oct. 9, 1967, p. 7.
[17] Petroleum Press Service. V. 34, No. 11, November 1967, p. 434.
[18] Petroleum Intelligence Weekly, Oct. 23, 1967, pp. 3–4.

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from the disagreement between the Government and the refinery operators over the Government's decision in 1966 to establish processing fees and product prices.

The refining and marketing operations of United States companies in Algeria ended in 1967 when they were nationalized and absorbed by SONATRACH. The action involved subsidiaries of Standard Oil (N.J.)—Esso—and Mobil Oil Corporation. Esso's subsidiaries held a 17.6 percent share in the Algiers refinery and about 20 percent of the domestic product market; Mobil's had a 6 percent share in the refinery and about 8 percent of the market. Both companies are to be compensated.

Earlier in the year SONATRACH bought British Petroleum's 10.4 percent refinery interest and its marketing network (about 13 percent of the domestic market). During the year SONATRACH held negotiations regarding the purchase of the marketing networks of Beryl (8 percent of the market) and Algeronaphte (6.5 percent). Other marketers in 1967 were Société Shell d'Algérie and Total. The marketing subsidiary of SONATRACH is called Compagnie Algeriénne de Distribution de Carburants.

According to new regulations, foreign companies must now request permission to refine and market in Algeria. The companies are obliged to buy from SONATRACH all the crude oil that is to be processed for them at the Algiers refinery. In addition, they must keep stocks equal to 3 months' consumption of each product they market, and build storage facilities for the stocks.[19]

Natural Gas.—Algeria's natural gas reserves in 1967 were estimated at 140,000 billion cubic feet,[20] the largest in Africa and the third largest in the world. About one-third of Algeria's gas reserves are in the Hassi R'Mel gasfield, one of the world's largest. Rhourde Nouss reportedly has a gas-condensate column of almost 3,000 feet.[21]

Data regarding gross production of natural gas are not available. Production of natural gas liquids (condensate) in 1967 was mostly from Hassi R'Mel.

Transportation.—In 1967 Algeria had 843 kilometers of natural gas pipeline and 296 kilometers of natural gas liquids line. Plans were made to build a 595-kilometer 40-inch gas line from the Hassi R'Mel gasfield to Skikda. SOFREGAS, a French firm, is to supervise the construction. Plans were also announced to build a second gas line from Hassi R'Mel to Arzew.

Natural Gas Liquefaction.—The Arzew liquefaction plant was closed for about 3 months in 1967 because of the embargo on exports to the United Kingdom, which receives about two-thirds of the plant's output.[22]

Late in the year the Government announced that it would soon invite bids to construct a liquefaction plant at Skikda, to be operating in 1971, with a daily capacity of about 435 million cubic feet. It will be operated by Société Mixte Algérienne de Gaz (SOMALGAZ), a company comprised of SONATRACH (50 percent), Enterprise de Recherches et d'Activités Pétrolières—ERAP (33⅓ percent), and CFPA (16⅔ percent).

In June 1967 Algeria concluded an agreement with France to increase exports of liquefied natural gas (LNG). Under this 15-year contract exports of LNG are to total the equivalent of 53 billion cubic feet the first year, 88 billion cubic feet the next 2 years, 106 billion cubic feet the fourth year, and 124 billion cubic feet thereafter.

[19] Petroleum Intelligence Weekly. Sept. 4, 1967, p. 3.
[20] Oil and Gas Journal. V. 65, No. 52, Dec. 25, 1967, p. 119.
[21] World Oil. V. 165, No. 3, Aug. 15, 1967 p. 43.
[22] Petroleum Intelligence Weekly. July 3, 1967, p. 7.

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The Mineral Industry of Angola, Mozambique, and Portuguese Guinea

By Henry E. Stipp [1]

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ANGOLA

The mineral industry of Angola contributed substantially to the Province's economy. The value of 1967 mineral commodity output, apparently increased slightly from that of 1966, and was estimated at about $64 million (excluding petroleum refinery products), or equal to about 6 percent of the gross national product (GNP) of $997 million.[2] Mineral commodity production in 1966 was valued at $63.5 million and the GNP at $954 million (current prices in that year). Large investments in petroleum and iron ore producing facilities were planned, which would make the mineral industry more important to Angola's economy. Employment by the mineral industry in 1967 was estimated at 32,000 persons.

PRODUCTION

The recovery and sale of diamonds was the second most important source of foreign exchange for Angola after the export of coffee. Diamond production in 1967 was valued at about $41.2 million compared with $40.7 million in 1966. The quantity of diamond recovered in 1967 increased 1.6 percent extending the trend that began in 1963. The potential for further growth in production was considered to be good.

Petroleum refinery operations were second to diamond in value totaling almost $14 million in 1967 compared with more than $15 million in 1966. The value of crude petroleum production was about $8.9 million in 1967 compared with $10.5 million in 1966. Output of crude petroleum was expected to increase considerably as a result of the discovery by Gulf Oil Co. of a new field offshore from Cabinda.

Iron ore production, which was valued at about $5 million in 1967, increased significantly. The expansion of mining operations at Cassinga by the Lobito Mining Co. and the planned initiation of iron ore mining at Cassala, east of Luanda, by the Angola Manganese Co. was expected to increase output of iron ore considerably.

TRADE [3]

Angolan mineral commodity exports were valued at more than $49 million in 1966 compared with almost $45 million in 1965. Diamond, valued at about $39 million, accounted for 80 percent of the 1966 total. Iron ore, valued at $4.7 million, and petroleum products, valued at about $4.3 million, were the next most significant mineral commodity exports.

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[1] Physical scientist, Division of International Activities.

[2] Where necessary, monetary conversions have been made at the rate of 28.75 escudo (Esc.) = US$1.

[3] Data on mineral commodity trade value are for those commodities shown in tables 2 and 3 of this chapter only, which may not represent complete mineral trade.

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Table 1.—Angola: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Copper:					
Mine	64				
Smelter	102				
Gold—troy ounces	37	7	2		
Iron ore—thousand tons	638	899	815	791	1,154
Manganese ore				18,550	33,180
Nonmetals:					
Cement—thousand tons	194	214	245	264	279
Diamond:					
Gem—thousand carats	759	NA	878	964	NA
Industrial—do	325	NA	277	304	NA
Total—do	1,084	1,149	1,155	1,268	1,289
Feldspar	809	501			
Gypsum	14,208	10,049	10,216	r 4,246	11,987
Salt—thousand tons	69	81	59	61	78
Mineral fuels:					
Asphalt rock	54,741	r 44,345	r 22,872	29,916	27,043
Coal	5,557			10,770	NA
Petroleum:					
Crude	799,657	904,757	655,365	631,319	537,152
Refinery products:					
Gasoline	59,775	53,337		60,115	55,880
Kerosine and jet fuel	12,594	35,735	43,939	51,108	49,711
Distillate fuel oil	253,536	258,695	291,179	130,905	107,131
Residual fuel oil	117,773	142,480	173,635	341,888	1 362,623
Asphalt	6,071	7,264	10,478	10,869	7,578
Liquefied petroleum gas (LPG)	4,149	6,118	7,460	8,575	8,679
Total	453,898	503,629	526,691	603,460	591,602

r Revised. NA Not available.
1 Contains an unknown quantity of distillate fuel oil.

Imports of metals, minerals, and fuels in 1966 were valued at more than $23 million compared with similar imports valued at more than $16 million in 1965.[4]

Mineral commodity imports consisted chiefly of iron and steel semimanufactures, petroleum refinery products, and fertilizer materials.

Angola's total commodity exports were valued at $224 million in 1966 compared with $202 million in 1965. Imports of all commodities were valued at $210 million in 1966 compared with total imports valued at $197 million in 1965.

COMMODITY REVIEW

Metals. — *Aluminum.* — A 25,000 ton annual capacity aluminum ingot plant was scheduled for construction by a company recently capitalized at $350,000.[5] The plant will obtain bauxite from France, Greece, and Australia and electrical power from the Cambambe Dam.

Copper.—Mining of copper has not been resumed since exhaustion of the Mavoio deposits in the Malange District of northwestern Angola.[6] Copper deposits in east-central Angola were reportedly discovered by the Angolan Mining Company.[7] The deposit at Cacimba-Pedra Grande, Moçâmedes District was being assayed by the Lobito Mining Company.

Gold.—Although there was no production in 1966 and 1967 the potential for extracting significant quantities of gold remained favorable. The Lobito Mining Company discovered two zones of gold-bearing rock South of Cassinga.[8] Reportedly the ore averaged 32 troy ounces of gold per ton.

[4] Direcção dos Servicos de Estatística, Comércio Externo (Luanda), V. 1, 1966, pp. 425
[5] The Standard Bank Reveiw (London). The Standard Bank Ltd., April 1967, p. 35.
[6] International Financial News Survey. Mining Developments in Angola. V. 19, No. 6, Feb. 17, 1967, p. 48.
[7] World Mining. Angola. V. 3, No. 7, June 26, 1967, p. 105.
[8] Metals Week. V. 38, No. 34, Aug. 21, 1967, p. 11.

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Table 2.—Angola: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum, mainly scrap	11	16	Italy 14; Portugal 2.
Copper, mainly scrap	257	304	Belgium-Luxembourg 87; United Kingdom 44; Netherlands 44; Italy 38.
Iron and steel:			
Ore	r 693,401	626,792	West Germany 306,706; Japan 274,288; Netherlands 20,574.
Scrap	4,149	103	Portugal 43; West Germany 34; Belgium-Luxembourg 14.
Semimanufactures	r 3,740	1,850	Other Africa 1,631; Mozambique 219.
Lead, scrap	177	213	All to Republic of South Africa.
Manganese ore	862	5,765	Spain 5,600; West Germany 165.
Zinc, all forms	46	18	Congo (Kinshasa) 17; Belgium-Luxembourg 1.
Ores, metallic n.e.s	8	1	All to West Germany.
Nonmetals:			
Cement	81,681	87,157	Republic of South Africa 63,014; Spanish possessions 13,510.
Clay and clay products:			
Minerals	10	---	
Brick, tile, etc	39	59	Zambia 32; São Tomé 14; Mozambique 13.
Diamond, thousand carats	1,157	1,264	All to Portugal.
Fertilizer materials:			
Mineral	606	1,672	Italy 1,285; Portugal 387.
Nitrogenous	20	---	
Granite	253	1,752	Belgium-Luxembourg 654; France 418; Netherlands 234.
Gypsum and anhydrite	5,566	5,703	All to Mozambique.
Marble	900	490	Italy 265; Portugal 95; Belgium-Luxembourg 47.
Pyrite, roasted	21,876	5,766	NA.
Salt	24,723	34,516	Congo (Kinshasa) 25,304; Southern Rhodesia 4,384; Portugal 2,678.
Sand	135	---	
Nonmetallic minerals, n.e.s	NA	13	Portugal 7, France 1; Belgium-Luxembourg 1; United States 1.
Mineral fuels:			
Coal, coke, and briquets	4	---	
Petroleum:			
Crude	114,182	1	All to Belgium-Luxembourg.
Refinery products:			
Gasoline	927	217	Bunkers 128; São Tomé and Príncipe 61.
Fuel oil	206,459	189,493	Bunkers 105,278; Portugal 67,275.

r Revised. NA Not available.

Iron Ore.—Shipments to Japan began in the latter part of 1967 with 45,000 tons from the Cassinga mine loaded at the port of Moçâmedes.[9] A new dock was planned for construction at Moçâmedes, which will permit trains to unload iron ore at the rate of 1,500 tons per hour and will accommodate ships of 100,000 tons capacity.[10]

A 695-kilometer rail line between the port of Moçâmedes and the Cassinga mine was scheduled for completion in 1967. Between 4 to 5 million tons of Cassinga iron ore were expected to be loaded at Moçâmedes in 1968.[11] Agreements were concluded with three Japanese steel mills to import 4 million tons of iron ore from Angola between 1968 and 1973.[12] In early 1967 the Portuguese Government guaranteed foreign loans contracted by the Lobito Mining Company for sums equivalent to about $95 million.[13] The loans were to be used for expansion of the mine and facilities at Cassinga and for railway and port construction. Employment at Cassinga was expected to reach 1,200 when full-scale operations begin early in 1968.[14]

Companhia do Manganes de Angola (Angola Manganese Co.) and Kluchner Steel Co. of West Germany were investigating low-grade iron ore deposits estimated at 500 million tons in the Cassala region east of Luanda. Construction of a pelletizing plant also was being evaluated.

Manganese.—Mining of manganese was

[9] Metal Bulletin (London), Cassinga's Japan Shipments Start. No. 5237, Oct. 6, 1967, p. 17.
[10] Work cited in footnote 6.
[11] Metal Bulletin (London), No. 5147, Nov. 11, 1966, p. 16.
[12] Mining Journal (London), V. 267, No. 6831, July 22, 1966, p. 51.
[13] International Financial News Survey. V. 19, No. 2, Jan. 20, 1967, p. 13.
[14] U.S. Consulate, Luanda, Angola. State Department Airgram A-90, Jan. 23, 1968, pp. 2-3.

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Table 3.—Angola: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966 [1]	Principal sources, 1966
Metals: [2]			
Aluminum	871	603	Belgium-Luxembourg 195; West Germany 133; Italy 76.
Copper	r [3] 998	[3] 540	Southern Rhodesia 204; France 201.
Gold—troy ounces	322	NA	
Iron and steel:			
Oxide and hydroxide	131	91	West Germany 45; Spain 36; Portugal 10.
Scrap	216	103	Portugal 61; São Tomé e Principe 42.
Pig iron and ferroalloys	652	1,862	United Kingdom 894; Portugal 456; West Germany 341; Republic of South Africa 121.
Ingots and other primary forms.	9	1,645	All from France.
Semimanufactures	43,785	54,830	Belgium-Luxembourg 18,366; France 9,528; Portugal 7,758.
Lead:			
Oxide	38	43	Portugal 32; West Germany 5; United Kingdom 3.
Metal	199	190	Portugal 79; Belgium-Luxembourg 67; United Kingdom 19.
Magnesium	2	------	
Mercury—76-pound flasks	105	7	All from Portugal.
Nickel	2	------	
Platinum—troy ounces	8	32	All from United States.
Silver—do	5,424	5,282	Switzerland 2,366; Portugal 2,076; France 322.
Titanium oxide	65	143	West Germany 69; United Kingdom 47; Finland 12.
Tin—long tons	37	50	Portugal 40; West Germany 3; Denmark 2.
Zinc:			
Oxide	45	36	Portugal 26; Belgium-Luxembourg 4; West Germany 3.
Metal	123	150	Japan 60; Portugal 27; Belgium-Luxembourg 26.
Metallic ore and concentrate, n.e.s.	8	2	All from Portugal.
Metallic compounds, n.e.s.	19	11	Norway 10; Netherlands 1.
Metals, precious, colloids, amalgams and salts—kilograms	1,217	192	France 88; Portugal 54; United States 23.
Metals, n.e.s.	4	7	All from United States.
Nonmetals:			
Abrasive materials:			
Mineral, including pumice	16	8	Portugal 5; United Kingdom 1; France 1.
Grinding wheels and stones	41	10	Portugal 9; West Germany 1.
Asbestos	1,364	1,352	Southern Rhodesia 853; Republic of South Africa 494.
Barite	804	1	All from West Germany.
Borates, natural	2	1	All from Portugal.
Carbon black	40	45	United States 42; Portugal 2.
Cement	2,316	[3] 3,178	Other Africa 2,283.
Chalk	449	428	Belgium-Luxembourg 200; Portugal 143; France 35.
Clay and clay products:			
Mineral	434	827	Portugal 514; Australia 108; United Kingdom 97.
Brick, tile, etc	2,489	702	All from Portugal.
Diatomite	147	130	United States 45; Portugal 36; Italy 20.
Dolomite, calcined	10	29	All from Norway.
Feldspar	20	15	All from West Germany.
Fertilizer materials:			
Mineral	41	------	
Manufactured:			
Nitrogenous	10,771	[3] 9,081	Other Africa 4,716; West Germany 3,157.
Phosphatic	3,547	[3] 4,830	Other Africa 3,065; Republic of South Africa 200.
Potassic	2,260	2,255	West Germany 1,301; France 533; Portugal 342.
Mixed	2,640	2,900	Portugal 2,098; West Germany 607; Netherlands 195.
Ammonia	42	40	Portugal 29; Republic of South Africa 7; West Germany 3.
Other	NA	[3] 2,900	Other Africa 1,163; West Germany 582.
Granite	56	1	All from United Kingdom.
Graphite	1	2	United Kingdom 1; West Germany 1.
Gypsum and anhydrite	134	218	Portugal 184; Belgium-Luxembourg 30; Netherlands 3.
Lime and limestone	16	31	All from Portugal.
Magnesite	3	------	
Marble	207	594	All from Portugal.
Mica, unworked and worked—kilograms	18,033	5,995	All from Norway.
Pigments, mineral	50	41	Portugal 36; Republic of South Africa 5.
Potash, caustic	6	4	Belgium-Luxembourg 3.

See footnotes at end of table.

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Table 3.—Angola: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966 [1]	Principal sources, 1966
Nonmetals—Continued			
Refractory materials, brick, tile, etc.	r 1,639	1,815	Other Africa 1,654.
Salt	191	91	Belgium-Luxembourg 50; Mozambique 23; United Kingdom 8.
Sand	4	2	All from Italy.
Soda, caustic	1,412	1,532	Netherlands 457; West Germany 322; Portugal 281.
Stone:			
Dimension, worked	68	NA	
Crushed or broken	146	217	Portugal 202; Belgium-Luxembourg 15.
Sulfur:			
Elemental	403	84	All from Portugal.
Dioxide	7	9	United Kingdom 6; West Germany 3.
Sulfuric acid	1,419	1,595	Portugal 1,537; Republic of South Africa 51; Netherlands 3.
Talc and steatite	52	83	Italy 26; Norway 26; West Germany 20.
Nonmetallic minerals, crude, n.e.s.	384	1,086	Cabo Verde 717; Portugal 336; West Germany 32.
Mineral fuels:			
Coal and briquets	20,341	32,151	Mozambique 21,718; Republic of South Africa 10,418.
Coal tar and other distilled products.	382	131	Netherlands 65; United Kingdom 56; Portugal 10.
Coke and semicoke	763	630	Zambia 343; West Germany 120; Republic of South Africa 110.
Petroleum, refinery products:			
Gasoline	8,554	[3] 6,795	Netherlands Antilles 2,678; Morocco 2,594.
Kerosine	5,476	[3] 6,207	Iran 4,773; Italy 700; Spain 400.
Distillate fuel oil	22,069	28,797	Iran, 16,227; Kuwait 7,075.
Lubricants	10,307	[3] 13,390	United States 5,368; Netherlands 2,203; United Kingdom 1,869.
Liquefied petroleum gas	340	3	All from Portugal.
Wax and jelly	110	99	Indonesia 50; West Germany 31; Netherlands 5.
Asphalt and bitumen	r [3] 22	[3] 5,007	Spain 1,800; Denmark 200.
Total	r 46,878	60,298	

r Revised. NA Not available.

[1] Source: Comércio Externo V.1, 1966.
[2] Scrap, unwrought and semimanufactures, including alloys, unless otherwise specified.
[3] Source: Anuario Estadistico V. 2, Provincias Ultramarinas.

halted in 1962 when the low price of ore on the world market made production uneconomical. However, in 1966 production was resumed on a small scale (18,550 tons) and increased substantially (21,640 tons) during the first half of 1967.[15]

Nonmetals.—*Phosphate Rock.*—Reserves estimated at 15 million tons were discovered in Cabinda and in Angola, north of Ambrizerte.[16]

Salt.—A factory for refining and packaging 50 tons of salt daily was constructed at Cacuaco near Luanda.[17]

Mineral Fuels.—*Asphalt, Natural.*—The feasibility of producing petroleum products from rock asphalt was being studied.[18] A pilot plant to process up to 100,000 tons of rock annually was planned to test the economic potential of the production process.

Petroleum.—Discovery of a large oilfield off the coast of Cabinda was announced by Cabinda Gulf Oil Co. a subsidiary of Gulf Oil Corp. of the United States.[19] The field which contains multiple reservoirs at depths ranging from about 1,300 feet to 1,600 feet and from 7,200 feet to 7,500 feet, is located offshore in shallow water about 24 kilometers north of the town of Cabinda. The company plans to produce about 30,000 barrels of

[15] Work cited in footnote 14.
[16] World Mining. V. 4, No. 7, June 28, 1968, p. 87.
[17] The Standard Bank Review (London). The Standard Bank, Ltd. November 1967, p. 39.
[18] Mining Journal (London). V. 268, No. 6855, Jan. 6, 1967, p. 9.
[19] Europe and Oil. Large Oil Discovery Announced by Cabinda Gulf Oil. V. 6, Nos. 10–11, October–November 1967, p. 36.

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crude oil per day by late 1968 and 150,000 barrels per day by 1970. Gulf was slated to spend $28 million in 1967 and $76 million in 1968 for plant and equipment to achieve the scheduled rates of production. Construction of a tank farm, and ancillary facilities on a 3,700-acre site about 16 kilometers north of the town of Cabinda was to begin in 1967. Offshore gathering centers will pump the crude to the tank farm, which will have storage capacity of 1.4 million barrels of the high-quality crude oil. A 36-inch pipeline 13 kilometers long will carry the crude to tankers of up to 100,000 tons capacity moored to a rotating buoy offshore. Tankers will be loaded at a rate of 30,000 barrels per hour.

A concession for exploration and development of oil in the Ambriz region, also in an area at the mouth of the Congo River, and in the eastern section of the Cuanza basin, was granted to Sociédade de Lubrificantes e Combustiveis (ANGOL).[20]

MOZAMBIQUE

The mineral industry of Mozambique, considered small by comparison with other sectors of the economy, began to show signs of expansion in 1967. Discovery of a large iron ore deposit in the Mirrote area near Namapa, and the granting of oil and gas rights to several international firms, emphasized the province's potential for minerals development. The decision to proceed with construction of the proposed Caborra-Bassa dam and hydroelectric facilities on the Zambeze River indicated a future source of power for development of mines and ancillary facilities. Mozambique continued to derive substantial revenue from the transit of minerals, mined in neighboring countries, through its territory to the ports of Lourenço, Marques and Beira.

PRODUCTION

The value of mineral production, excluding petroleum products, in 1967 increased to an estimated $8.2 million compared with almost $7.2 million in 1966.[21] In 1967 the petroleum refinery at Matola, using imported crude oil produced products valued at an estimated $21 million compared with 1966 output valued at an estimated $14 million.

TRADE

Detailed data on trade for Mozambique were not available for 1965 and 1966. Information from official sources indicated that exports of selected metals and mineral commodities from Mozambique in 1966 were valued at more than $18 million compared with exports of more than $16 million in 1965. Shipments of mineral commodities consisted primarily of petroleum refinery products, metallic minerals, cement, and coal.

Imports of selected metal and mineral commodities were valued at almost $33 million in 1966 compared with imports valued at about $27 million in 1965. Mineral commodity imports consisted principally of crude petroleum and petroleum products, iron and steel semimanufactured products, fertilizers, and coal.

Official data on value of total Mozambique commodity trade has not been available for any year since 1963, when exports valued at almost $453 million, and imports valued at $494 million were reported.[22]

Metals.—*Aluminum.*—A group of Mozambinque industrialists and bankers applied for a license to construct a plant to produce alumina, aluminum, and caustic soda, using bauxite from Malawi and Mozambique and electric power from the proposed Cabora Bassa Dam. Sea water would be used for producing caustic soda at another plant near Dondo.[23]

An aluminum fabricating plant owned by Fabrica de Aluminios de Moçambique began producing some aluminum consumer products.[24] By June 1968 a larger variety of household articles will be produced.

Copper.—Deposits of copper minerals (azurite and malachite) reportedly were discovered in the region around Nacala north of the port of Moçambique.[25]

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[20] Mining Journal (London). Oil Search in Angola. V. 268, No. 6877, June 9, 1967, p. 469.
[21] Where necessary, monetary conversions have been made at the rate of 28.57 escudo= US$1.
[22] Instituto Nacional de Estatistica (Portugal). Anuário Estatístico. V. 2, 1966, p. 85.
[23] U.S. Embassy, Lisbon, Portugal. State Department Airgram 416, Oct. 7, 1967, p. 1.
[24] The Standard Bank Review (Johannesburg). The Standard Bank of South Africa Ltd. September 1967, p. 27.
[25] Overseas Review (London). Barclays Bank D.C.O. July 1967, p. 28.

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Table 4.—Mozambique: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Bauxite	6,593	6,278	5,683	5,818	6,276
Beryl	556	r 383	r 219	80	169
Bismuth	r 14	r 8	r 6	2	2
Cesium (pollucite)	NA	4	7	-------	-------
Columbium and tantalum concentrate [2]	153	189	140	135	159
Copper ore:					
Chalcopyrite	-------	122	340	696	119
Carbonate	-------	-------	-------	-------	95
Gold, troy ounces	29	40	32	r 22	22
Tin ore, cassiterite, kilograms	-------	-------	101	r 584	446
Nonmetals:					
Asbestos	-------	-------	80	486	507
Cement, thousand tons	167	182	220	225	e 248
Clays:					
Kaolinite	5	10	105	350	577
Montmorillonite (chiefly bentonite)	800	825	2,723	3,866	4,631
Diatomite	-------	-------	-------	30	5
Feldspar	-------	-------	50	-------	120
Garnet, kilograms	-------	-------	2,724	r 1,586	1,021
Lithium (mainly lepidolite)	104	-------	75	NA	250
Mica (mainly scrap)	-------	-------	10	NA	100
Monazite, kilograms	-------	-------	-------	11	300
Perlite	-------	-------	24	181	-------
Quartz [3], kilograms	208	452	405,400	-------	80
Salt [4], thousand tons	40	-------	30	r 26	38
Tourmaline	316	2,455	317	r 4,540	4,128
Mineral fuels:					
Coal, bituminous, thousand tons	283	245	238	r 295	282
Petroleum refinery products:					
Gasoline	94,303	101,627	104,438	r 117,549	e 137,000
Kerosine	NA	NA	NA	NA	-------
Distillate fuel oil	116,734	133,820	148,244	r 192,506	e 358,000
Residual fuel oil	230,659	246,261	241,687	r 298,633	
Liquefied petroleum gas	1,337	2,239	2,567	e 2,600	NA
Total	443,033	483,947	496,936	611,288	NA

e Estimate. r Revised. NA Not available.

[1] In addition to commodities listed, construction materials such as clay, sand, gravel, and quarry dimension stone are produced, but quantitative data are not available. Substantial tonnages of lime and limestone also are produced but data are not available. Small quantities of euxenite, smarskite, monozite and amazonite are produced intermittently.

[2] Includes microlite, 73 tons in 1963; 154 tons in 1964; 85 tons in 1965; 79 tons in 1966; 70 tons in 1967.

[3] Quartz crystal only during 1963–64; 405 tons of noncrystal variety in 1965.

[4] Largely marine salt; includes 20 to 30 tons of rock salt annually.

Gold.—A vein containing very large and pure nuggets was discovered in the Manica area near the Rhodesian border.[26]

Iron Ore.—A large deposit of iron ore was discovered near Namapa, Mirrote area of northern Mozambique.[27] Reportedly the ore (up to 68 percent iron) compared in iron content with that of the Cassinga deposit. Several Portuguese and African firms were prepared to finance development of a mine at a cost of about $56 million. It was estimated that 5,000 tons of ore could be mined during the first year the mine operated. Mozambique railway personnel were studying the possibility of constructing 136 kilometers of rail line to connect the mine with the port of Nacala. Japanese firms were reported to be interested in constructing the railway. A wharf to berth ships of up to 100,000 tons capacity was planned for Nacala to facilitate shipments of iron ore to Japan.[28]

Iron and Steel.—Two blast furnaces, one with an initial capacity of 30,000 tons, were scheduled to be constructed in the Beira area by a group of firms headed by Sociédade Algodeira de Formento Colonial and Sociédade Hidroelectrica do Revue.[29] The plant will use iron ore from the area near Tete and scrap from local sources. Nothing further was reported on the 250,000-ton-per-year steel works planned for construction at Beira by Companhia de

[26] Overseas Review (London). Barclays Bank D.C.O. August 1967, p. 28.

[27] Overseas Review (London). Barclays Bank D.C.O. November 1967, p. 27.

[28] Standard Bank Review (London). The Standard Bank Ltd. November 1967, p. 38.

[29] Metal Bulletin (London). No. 5226, Aug. 25, 1967. p. 16.

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Table 5.—Mozambique: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966 [1]	Principal destinations, 1966
Metals:			
Aluminum:			
Bauxite	5,661	5,890	All to Southern Rhodesia.
Beryllium: Beryl	221	82	United States 56; Japan 25.
Bismuth:			
Bismuthite—kilograms	5,360	1,000	All to Netherlands.
Cesium: Pollucite—do	7,000	NA	
Chromium: Ore and concentrate	[2] 18,547	[2] 37,043	United States 14,395; Japan 11,867; United Kingdom 9,594.
Columbium and tantalum:			
Columbite-tantalite—kilograms	65,040	72,500	United States 51,000; United Kingdom 21,000.
Microlite—do	95,300	70,012	United States 43,000; United Kingdom 26,512.
Copper:			
Chalcopyrites	330	680	All to Belgium.
Matte	NA	456	NA.
Iron and steel:			
Ore and concentrate	NA	[3] 6,532	Southern Rhodesia 5,624; Belgium-Luxembourg 680; United States 150.
Pig iron and ferroalloys	[2] 30,868	[2] 23,326	United States 22,268; Belgium-Luxembourg 958.
Scrap	NA	[3] 5,389	NA.
Lead, unwrought	NA	[2] 760	All to Norway.
Manganese:			
Ore and concentrate	17,687	NA	
Nonferrous metal scrap and waste.	[2] 25,022	[2] 27,528	Japan 16,043; United Kingdom 9,658.
Tin—long tons	-------	[2] 54	All to Netherlands.
Nonmetals:			
Amazonite—kilograms	2,800	22,370	West Germany 9,100; United States 7,200; Japan 5,000.
Asbestos	149	206	United Kingdom 165; Republic of South Africa 26.
Cement	NA	11,468	NA.
Clays:			
Montmorillonite	2,588	3,469	Netherlands 1,125; United Kingdom 868; Portugal 380.
Diatomite	-------	30	All to Republic of South Africa.
Euxenite—kilograms	6,600	NA	
Garnet—do	NA	3,789	West Germany 3,669; Southern Rhodesia 120.
Mica, scrap—do	10,000	NA	
Perlite—do	23,600	181	All to Republic of South Africa.
Quartz, rose—do	172	NA	
Salt, refined	NA	8,924	NA.
Tourmaline	NA	797	West Germany 372; Southern Rhodesia 267.
Mineral fuels:			
Coal, bituminous and coke	98,666	[3] 85,912	Kenya 46,708; Angola 21,716; Malawi 17,431.
Petroleum refinery products:			
Gasoline	63,752	90,561	Republic of South Africa 83,497; Southern Rhodesia 7,007.
Kerosine and diesel oil	75,508	103,469	Republic of South Africa 80,895; Bunkers 20,552; Malawi 1,446.
Fuel oil, unspecified	183,864	282,652	Portugal 144,775; French Somaliland 49,959; Bunkers 87,578.

NA Not available.
[1] Source: Boletim Mensal (Lourenço Marques), Provincial Directorate of Statistical Services. V. 8, No. 3, March 1967, pp. 44–54.
[2] Source: Statistical Office of the United Nations. Supplement to the World Trade Annual. V. 3, 1965 and 1966.
[3] Anuário Estatistico (Portugal), Instituto Nacional De Estatistica. V. 2, 1966.

Urânio de Moçambique and a French consortium.[30]

Tantalum.—A large deposit of pegmatite rock that contained the mineral tantalite reportedly was discovered near Murrua.[31] Reserves of pegmatite were estimated to be mineable for 30 years.

Titanium.—Large reserves of titaniferous magnetite, which could yield iron, titanium and vanadium, were reported to occur in the Tete area.[32] Other workable deposits in this area contain manganese, copper, nickel, chrominum, and asbestos.

Nonmetals. — *Cement.* — Companhia de Cimentos de Moçambique planned to build

[30] Metal Bulletin (London). No. 5146, Nov. 8, 1966, p. 11.
[31] Overseas Review (London). Barclays Bank D.C.O. March 1967, p. 24.
[32] The standard Bank Review (Johannesburg). The Standard Bank of South Africa Ltd., February 1967, p. 25.

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Table 6.—Mozambique: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal sources, 1966
Metals: [2]			
Aluminum	542	466	NA.
Copper, matte and wrought	[e] 500	627	Southern Rhodesia 214; Republic of South Africa 125; Portugal 31.
Iron and steel:			
Scrap	([3])	([3])	
Pig iron, ingots, primary forms.	7,204	11,385	NA.
Semimanufactures	57,343	59,046	Belgium-Luxembourg 18,421; Republic of South Africa 10,436; Japan 2,916; United States 1,957.
Tin—long tons	[4] 46	[4] 47	All from Portugal.
Nonmetals:			
Asbestos	[4] 399	[4] 439	All from United Kingdom.
Brick and tile	[4] 605	[4] 2,091	All from Portugal.
Fertilizer materials:			
Nitrogenous	16,572	15,354	
Other	4,546	9,441	
Total	21,118	24,795	West Germany 8,590; Portugal 7,532; Netherlands 5,839.
Sand and gravel	[4] 1,076	[4] 1,779	All from Portugal.
Stone, building	NA	[4] 952	Do.
Sulfur	[4] 13,679	----------	
Other nonmetals	NA	[4] 914	All from Portugal.
Mineral fuels:			
Coal, coke and briquet	344,322	230,353	Republic of South Africa 211,156; Southern Rhodesia 17,278.
Petroleum:			
Crude	535,419	653,213	All from Iraq.
Refinery products:			
Gasoline	22,421	28,289	Iraq 21,716; Saudi Arabia 6,312.
Kerosine	18,901	21,526	Iraq 18,832; Saudi Arabia 2,655.
Fuel and diesel oil	40,966	50,782	Iraq 28,581; Saudi Arabia 16,616; Republic of South Africa 1,781.
Lubricants	8,990	9,926	United Kingdom 3,157; Republic of South Africa 2,707; United States 2,060; Portugal 1,828.

[1] Source: Boletim Mensal (Lourenço Marques), Provincial Directorate of Statistical Services. V. 7, No. 3, March 1966, pp. 41–58.
[2] Source: Boletim Mensal (Lourenço Marques), Provincial Directorate of Statistical Services. V. 8, No. 3, March 1967, pp. 44–54.
[3] Included with semimanufactures.
[4] Source: Statistical Office of the United Nations. Supplement to the World Trade Annual. V. 3, 1965 and 1966.

a cement factory in the Tete area.[33] The factory will process cement clinker produced at other company plants.

Fluorspar.—A new company, Interminas Fluorite de Moçambique (Fluorspar Intermines of Mozambique), was formed to explore and exploit fluorspar deposits near Canxixe in Manica and Sofala Districts and near Chioco in the Tete District.[34] Société de Mineraux (Luxembourg) and Continental Ore Corp., a U.S. firm, were among participants in the new company. The deposits were being studied by mineral specialists from Continental Ore's Mexican affiliates. Interminas planned to build beneficiation plants at a later date.

Miscellaneous.—South African geologists reportedly found deposits of diamond, manganese, and asbestos in the Catuane area.[35] The company Gabinete Moçambique de Organizaçoes Ida. and a South African group planned to finance mining activities in the area.

Mineral Fuels.—*Asphalt.*—A $3.5 million refinery located at Matola became operable.[36] Asphalt from this refinery will be used to complete the highway from Lourenço Marques to Beira and a road to connect Mozambique and Angola.

[33] The Standard Bank Review (Johannesburg). The Standard Bank of South Africa Ltd., May 1967, p. 25
[34] Bureau of Mines. Mineral Trade Notes. V. 64, No. 12, December 1967, p. 15.
[35] Overseas Review (London). Barclays Bank D.C.O. December 1967, p. 27.
[36] International Financial News Survey, Industrial Development in Mozambique. V. 19, No. 5, Feb. 10, 1967, p. 39.

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Coal.—A large deposit of coking coal located near Tete reportedly has been proved.[37]

Petroleum.—Portugal granted exclusive rights for oil and gas in two areas totaling about 4,600 hectares to a group of international firms comprised of Angola American Corp., (50 percent), Société Nationale des Pétroles d'Aquitaine (40 percent), and Entreprise de Recherches et d'Activities Pétrolières (10 percent).[38] The concession areas are north and east of Beira and north and west of Ponta da Barra; about one-third of the total area is offshore. Exploration rights were granted for 3 years, renewable for one period of 3 years and two consecutive 2-year periods. Exploitation rights will be granted for 40 years, with an extension period of 15 years. Work was expected to start in early 1968 with aerial and geophysical operations.

Portugal also granted exploration rights on 6 million hectares to a three company combine operated by Sunray DX Oil Co. and included Skelly Oil and Clark Oil and Refining subsidiaries.[39] At yearend Sunray began setting up its base at Lourenço Marques. It was reportedly spending about $3.6 million for exploration. Hunt Petroleum Company of the United States also was granted an oil and gas exploration concession.[40]

PORTUGUESE GUINEA

There was no significant production of mineral commodities in Portuguese Guinea in 1967. However, minor output of construction materials for local consumption probably was continued. Deposits of bauxite reportedly occur along the border with Guinea, but have not been developed because of inadequate transportation. Esso Exploration Guiné Inc. was preparing to explore for oil in the interior of the province in January 1966.

Complete trade statistics for Portuguese Guinea were not available for 1966. Official preliminary data indicated that during the first 4 months of 1966 imports of mineral commodities totaled 11,074 tons, valued at $769,233. There were no exports of mineral commodities in the corresponding period. During 1965, mineral commodity imports by Portuguese Guinea totaled 25,327 tons, valued at $1,469,443. These consisted entirely of petroleum products and cement. There were no recorded exports of mineral commodities in 1965.

[37] Work cited in footnote 32.
[38] Skillings' Mining Review. Anglo American Corp. Mozambique Oil Exploration. V. 56, No. 50, Dec. 16, 1967, p. 16.
[39] U.S. News and World Report. V. 64, No. 5, Jan. 29, 1968, p. 78.
[40] Standard Bank Review (London). The Standard Bank Ltd. January 1968, p. 33.

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The Mineral Industry of Argentina

By Garn A. Rynearson [1]

Argentina in 1967 contributed comparatively insignificant quantities of mineral commodities to world supplies and continued to depend heavily on imports to meet domestic requirements. Except for the mineral fuels sector, the industry generally reflected the nation's slow overall economic growth; the gross national product (GNP) increased only about 2 percent over that of 1966, partly because of stringent Government-imposed stabilization measures in effect through most of the year. In the mineral fuels sector, increased crude oil output brought Argentina closer to self-sufficiency, and output of coal and natural gas also showed significant increases, although the country still imported a major share of coal requirements and planned sizable natural gas imports. A major step toward attaining self-sufficiency in fuel was taken when a new hydrocarbon law was enacted, permitting private companies to again obtain petroleum exploration and exploitation permits and transportation concessions.

As a part of its efforts to encourage domestic mineral production, the Government was involved in several mapping and mineral exploration programs. The ultimate outcome of one such project involving large iron ore deposits is yet to be evaluated, but an exploration project on a gold-silver-manganese deposit has apparently demonstrated that the deposits are of little commercial interest.

The largest, most ambitious program undertaken has been the Plan Cordillerano, covering approximately 128,000 square kilometers in the Andean region of central Argentina. This project, a joint United Nations Special Fund and Fabricaciones Militares venture which was begun in 1963, is scheduled for completion in June 1968. The most notable results of the plan have been discovery and preliminary exploration of several large, low-grade, porphyry-type copper deposits that may prove commercially exploitable.

A similar program, known as the Plan Cordillera Norte, was inaugurated in 1963 by the Instituto Nacional de Geología y Minería in the Provinces of Salta, Jujuy, Catamarca, Tucumán, and La Rioja. In August 1967 the Instituto signed an agreement with the Direccíon General de Fabricaciones Militares to implement a long-range survey and exploration program in an area covering 266,430 square kilometers. Later, the Instituto was authorized to call for bids from domestic and foreign firms to carry out an aerial survey of about 195,000 square kilometers in the region.

In addition to the new hydrocarbons law, during 1967 the Government enacted several other measures designed to promote mineral industry development. In March, import duties on most capital goods were reduced to facilitate importation of much needed machinery and other equipment. Import duties on most mineral raw materials were also reduced. In September, Decree-Law No. 17432 provided for a 100-percent credit against income tax for investments in machinery, transportation equipment, power generation, and all other installations destined for mineral exploration, extraction, or processing. Law No. 17179 dissolved the Comité de Comercialización de Minerales (COCOMINE), created in 1958 to promote private sector mineral activity through government mineral purchases at fixed support prices, assistance in transportation needs, lease of government property, and government purchase and sale of machinery, equipment, and spare parts used in the mining industry.

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[1] Physical scientist, Division of International Activities.

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PRODUCTION

The mineral industry in 1967 showed modest increases for many of the more important commodities utilized domestically or produced for export; performance in lesser commodities was mixed. Iron ore output increased appreciably but not enough to significantly reduce iron ore imports. The iron and steel and lead-zinc industries registered gains over 1966 output, but failed to attain record levels set in 1965, while producers of tin-silver and tungsten concentrates registered marked increases over recent past years.

Among nonmetallic minerals, borate output was particularly disappointing, less than half that of 1966, and not quite one-third the 1965 level. Salt production decreased by about 8 percent. Output of cement, limestone, dolomite, and stone and gravel for concrete aggregate continued to increase, reflecting the general rise in construction.

New record high levels set for coal and petroleum output and a significant rise in natural gas withdrawals were highlights of the 1967 mineral industry performance. Slightly higher crude oil runs to refineries in 1967 were partly offset by decreased utilization of natural gas and natural gasoline feedstocks, and total output of finished liquid refinery products was less than 1 percent more than in 1966.

Table 1.—Argentina: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Beryl, about 11 percent BeO	377	189	225	255	268
Bismuth:					
Gross weight of ore kilograms	3,750	20	----------	----------	5,100
Metal content of ore do	610	4	----------	----------	76
Columbite-tantalite do	600	----------	267	5,726	3,000
Copper:					
Gross weight of ore	4,001	6,564	11,154	6,666	8,234
Metal content of ore	391	345	518	337	410
Gold troy ounces	313	303	84	160	NA
Iron and steel: [1]					
Iron ore thousand tons	100	95	116	156	224
Pig iron do	422	588	663	522	610
Ferroalloys do	12	15	18	18	NA
Crude steel [2] do	895	1,265	1,368	1,267	1,326
Rolled products do	772	1,379	1,537	1,274	1,327
Lead:					
Gross weight of concentrate	34,235	33,911	42,536	38,996	42,698
Metal content of concentrate	26,465	25,924	32,236	29,483	32,201
Smelter production [3]	24,000	23,000	32,000	22,000	NA
Manganese ore:					
30 to 40 percent manganese	11,282	19,400	20,363	11,768	20,232
Under 30 percent manganese	17,933	17,868	8,751	16,002	9,064
Total	29,215	37,268	29,114	27,770	29,296
Silver, content of ore and concentrate thousand troy ounces	1,943	1,943	2,286	2,207	2,640
Tin:					
Gross weight of concentrate long tons	1,311	1,929	2,775	2,687	4,203
Metal content of concentrate do	225	343	497	458	802
Tungsten:					
Gross weight of concentrate	144	56	130	131	204
Standard 60 percent WO_3 equivalent of concentrate	167	61	144	144	221
Uranium:					
Gross weight of ore	4,669	21,757	29,604	131	12,452
Uranium oxide (U_3O_8) content of ore kilograms	8,530	33,536	r 44,937	249	23,000
Vanadium:					
Gross weight of concentrate	240	260	----------	----------	NA
Metal content of concentrate	3	3	----------	----------	NA
Zinc:					
Gross weight of concentrate	56,189	45,261	59,172	52,934	54,393
Metal content of concentrate	28,737	22,913	29,679	26,446	27,199
Smelter production [3]	19,700	22,200	23,600	22,283	e 23,000

See footnotes at end of table.

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Table 1.—Argentina: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Nonmetals:					
Alabaster	430	353	338	270	1,038
Asbestos	331	492	220	57	182
Barite	22,997	14,505	r 19,816	17,987	18,000
Borates	24,215	16,115	45,700	35,345	16,173
Calcite, nonoptical	19,970	6,763	5,550	5,098	NA
Calcium carbonate, natural	18,481	33,685	42,031	55,467	NA
Cement [4] thousand tons	2,535	2,891	3,305	3,487	3,552
Clays:					
Bentonite do	34	37	48	43	30
Kaolin do	36	43	73	73	65
Refractory clay do	76	94	118	113	105
Other do	241	295	460	533	687
Diatomite	5,675	7,772	r 6,145	10,943	8,146
Dolomite	123,580	102,402	104,800	139,566	169,772
Feldspar	12,801	9,273	r 21,640	21,409	19,214
Fertilizer materials:					
Ammonia, anhydrous [5]	5,245	4,981	5,692	5,967	5,480
Ammonium sulfate [5]	12,709	13,291	11,653	13,141	12,678
Guano	811	180	120	65	236
Fluorspar	9,762	11,524	11,687	16,088	15,000
Garnet (almandite)	150	90	60	85	95
Graphite	278	222	183	157	214
Gypsum	196,098	154,542	r 246,312	288,202	268,000
Limestone thousand tons	6,549	6,598	r 7,619	8,257	8,400
Lithium minerals	1,436	725	622	270	240
Mica:					
Sheet	89	142	105	132	137
Waste and scrap	------	532	118	958	859
Pigments, mineral: Ocher	70	25	48	65	40
Quartz, for nonelectronic uses thousand tons	30	21	36	50	35
Rhodochrosite, ornamental	------	------	122	309	206
Salt thousand tons	275	393	r 767	894	819
Sodium compounds: Caustic soda [5]	33,389	40,630	51,145	50,842	47,564
Stone, sand and gravel, n.e.s.:					
Dimension stone:					
Marble and other calcareous materials	26,397	15,803	15,332	23,880	19,471
Granite	9,161	7,025	5,547	7,679	(6)
Other	48,552	42,727	46,712	37,250	NA
Crushed stone, all types thousand tons	3,670	3,184	3,553	3,742	3,866
Sand:					
Common do	5,867	5,203	5,726	6,884	6,035
Glass do	r 82	99	138	130	90
Gravel do	1,799	1,320	1,499	1,896	NA
Strontium mineral: Celestite	540	30	598	370	NA
Sulfur, elemental, refined	22,696	22,307	23,766	30,422	32,796
Sulfates, hydrous:					
Aluminum (alum)	10,926	12,716	7,707	3,834	2,614
Iron (melanterite)	------	------	900	362	185
Magnesium (epsomite)	2,447	2,637	3,020	1,136	1,471
Sodium (mirabilite)	9,856	9,242	r 21,927	21,903	27,617
Talc, soapstone and pyrophyllite:					
Pyrophyllite	8,918	7,245	9,267	6,640	7,867
Steatite	3,080	6,409	1,350	2,767	530
Talc	16,063	11,144	r 20,851	20,442	17,000
Vermiculite	2,780	3,693	1,685	4,162	2,396
Zeolites	70	80	63	25	43
Mineral fuels:					
Asphaltites	5,432	4,401	3,817	3,842	3,857
Carbon black	5,815	11,400	14,500	NA	NA
Coal, bituminous thousand tons	209	332	374	r 357	412
Coke: Oven and beehive do	315	451	461	e 460	NA
Gas, natural (gross) [7 8] million cubic feet	210,000	232,572	220,236	210,576	228,419
Peat	10,825	3,877	3,652	5,194	2,198
Petroleum:					
Crude [7] thousand 42-gallon barrels	97,141	100,276	98,276	104,760	114,673
Natural gasoline do	1,098	896	1,160	979	600
Refinery products: [7 9]					
Gasoline:					
Aviation do	316	384	190	456	550
Other, including naphtha do	22,083	23,717	27,498	29,408	30,643
Jet fuel do	629	779	943	1,103	1,460

See footnotes at end of table.

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Table 1.—Argentina: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [2]	1963	1964	1965	1966	1967 [p]
Mineral fuels—Continued					
Petroleum—Continued					
Refinery products—Continued					
Kerosine [10]					
thousand 42-gallon barrels	7,644	8,502	7,727	7,138	6,714
Distillate fuel oil_____do____	19,256	17,958	22,353	26,587	27,284
Residual fuel oil_____do____	42,022	46,868	52,906	54,233	53,030
Lubricants, including greases_____do____	860	979	1,058	983	875
Liquefied gas_____do____	3,394	3,562	3,566	3,589	3,943
Asphalt_____do____	NA	2,910	2,265	1,823	2,071
Other liquid products____do____	638	748	783	683	680
Petroleum coke_thousand tons	NA	351	356	424	435
Refinery gas million cubic feet	NA	9,712	9,768	10,774	11,115

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Metal and alloy data revised where necessary to conform with latest available statistics compiled by Instituto Latinoamericano del Fierro y el Acero.

[2] Data do not include small quantities of foundry-produced crude steel and castings totalling approximately 15,000 to 25,000 tons per year.

[3] Data based on statistics compiled by American Bureau of Metal Statistics.

[4] From data compiled by United Nations which presumably include white and special cement as well as common portland cement.

[5] Output reported by Fundación Investigaciones Económicas Lationoamericanas.

[6] Not reported separately. Quantity included in figure shown for crushed stone.

[7] Data revised where necessary to conform with basic statistics of Dirección Nacional de Energía y Combustibles.

[8] Converted from cubic meters at rate of 1 cubic meter equals 35.3145 cubic feet.

[9] Includes some products derived in part from natural gas and natural gasoline.

[10] Includes power kerosine heretofore grouped with other nonspecified products in previous volumes of Minerals Yearbook.

Source: Instituto Nacional de Geología y Minería for most commodities. Principal exceptions are indicated in footnotes.

TRADE

Incomplete data on Argentina's 1967 mineral commodity trade indicate the chronic value imbalance persisted, but that the relative deficit may have been somewhat less than in 1966, largely because of decreased metal and mineral fuels imports and slightly increased metal exports, particularly iron and steel semimanufactures and tin-silver concentrates.

Mineral fuel imports decreased from $111 million in 1966 to about $96.3 million in 1967, chiefly because of lower crude petroleum imports, valued at $50.7 million in 1967 compared with $64.2 million in 1966. A nearly twofold increase in liquefied gas import value almost offset decreases in the value of imported refinery products.

Exports of mineral fuels decreased from $15 million in 1966 to $8.1 million in 1967, with no exports of distillate fuel oil and a considerable reduction in the amount of residual fuel oil exports.

Despite the mineral commodity trade deficit, Argentina continued to show a favorable total trade balance. Exports in 1967 totaled $1,465 million whereas imports amounted to only $1,096 million. Comparative figures for 1966 were $1,593 million for exports and $1,124 million for imports.

The Latin America Free Trade Association (LAFTA), of which Argentina is a member, has adopted a standard tariff nomenclature (NABALALC), based on the Brussels Nomenclature (BTN). Argentina adopted its version of the NABALALC nomenclature on December 1, 1965, and utilized this version in foreign trade statistics for 1966, the latest complete Argentine trade compilation available. As a result of this change, data for 1965 and 1966 are not universally comparable and some modifications in mineral trade tables have been necessary.

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Table 2.—Argentina: Value of trade in mineral commodities

(Thousands)

	1965	1966
Exports:		
Metals:		
Iron and steel	$6,399	$9,437
Tin-silver concentrates	1,188	1,648
Other	934	820
Nonmetals:		
Salt	1,082	861
Other	769	1,157
Mineral fuels:		
Distillate fuel oil	1	2,998
Residual fuel oil	8,754	9,491
Other	1,004	2,564
Total	20,131	28,976
Imports:		
Metals:		
Aluminum [1]	21,210	22,395
Copper	38,006	30,321
Iron ore and scrap	22,100	11,549
Iron and steel	176,211	130,659
Tin and alloys	5,648	5,797
Titanium oxides [2]	2,184	2,746
Other	5,342	6,292
Nonmetals:		
Asbestos	2,816	2,687
Fertilizer materials	11,462	6,205
Refractories [3]	5,501	5,524
Sodium carbonate	5,413	6,007
Other	7,146	7,004
Mineral fuels:		
Coal and coke	14,450	13,977
Gas	12,226	11,708
Crude petroleum	62,386	64,166
Distillate fuel oil	13,634	9,802
Lubricants	8,604	7,108
Other	5,919	4,228
Total	420,258	348,175

[1] Includes bauxite, alumina, metal, and alloys.
[2] Including mineral concentrates.
[3] Including refractory clay.

Table 3.—Argentina: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum and alloys, all forms	136	11	Paraguay 10; Venezuela 1.
Beryl	159	248	All to United States.
Bismuth ore and concentrate. kilograms	14,914	------	
Copper:			
Concentrates [1]	239	267	All to Spain.
Metal and alloys, all forms	56	14	Uruguay 10; Bolivia 1; Brazil 1.
Iron and steel:			
Ingots and other primary forms	200	12,133	All to Uruguay.
Semimanufactures:			
Bars and rods:			
Wire rod	11,287	26,845	United States 17,481; Brazil 5,452; Uruguay 3,419.
Other	[2] 2,779	7,883	Brazil 3,303; Paraguay 1,948; Uruguay 1,737.
Angles, shapes, and sections	1,446	3,961	Uruguay 3,584; Paraguay 351.
Flat products	710	2,561	Uruguay 2,303; Bolivia 151.
Wire	2,256	2,823	Paraguay 1,830; Venezuela 570; Brazil 287.
Tubes, pipes, fittings	18,875	20,521	United States 13,331; Colombia 1,688; Bolivia 1,381.
Other	------	29	Bolivia 25; Uruguay 3.

See footnotes at end of table.

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Table 3.—Argentina: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Lead:			
Ore and concentrate	153	218	Belgium 119; United States 99.
Metal and alloys, all forms	11	1	All to Bolivia.
Silver, unwrought. thousand troy ounces	164	219	United Kingdom 206.
Tantalite kilograms	------	4,114	All to United States.
Tin:			
Concentrate [1] long tons	2,206	3,222	All to United Kingdom.
Solder do	------	1	All to Chile.
Tungsten ore	25	50	United Kingdom 30; Netherlands 20.
Zinc:			
Concentrate	2,671	--------	
Metal and alloys, all forms	148	102	Brazil 87; Uruguay 15.
Other:			
Ores, n.e.s	101	2	United States 2.
Drosses, skimmings, residues, powder.	392	347	Netherlands 286; United Kingdom 61.
Metals and alloys, all forms	14	(2)	
Nonmetals:			
Barite	70	233	Bolivia 204; Paraguay 29.
Borates, crude	204	160	Brazil 100; Uruguay 60.
Cement	1,313	7,518	Paraguay 4,769; Bolivia 1,770.
Clays:			
Bentonite	5,218	6,442	Brazil 2,987; Bolivia 1,438; Chile 1,399.
Kaolin	10	5	All to Uruguay.
Other	116	8	Brazil 5; Japan 1; Bolivia 1.
Dolomite	853	1,430	All to Chile.
Fluorspar	512	881	Chile 757; Uruguay 124.
Gypsum, crude and calcined	14,146	18,437	Uruguay 18,232.
Lime	133	67	All to Bolivia.
Mica	493	332	Italy 202; Spain 50.
Onyx	147	213	Italy 210.
Rhodochrosite, ornamental. kilograms	600	1,550	West Germany 1,200; Australia 350.
Salt	89,470	59,883	Uruguay 39,878; Paraguay 19,961.
Stone, dimension, crude:			
Marble	207	272	Italy 170; Netherlands 38; West Germany 25.
Granite	1,789	3,825	Italy 3,333; Japan 492.
Other	(4)	124	Bolivia 83; Paraguay 41.
Talc	(4)	65	All to Chile.
Other nonmetals	414	242	Uruguay 100; Paraguay 98; Chile 40.
Mineral fuels:			
Carbon black	[5] 1,788	3,213	Uruguay 1,684; Brazil 938; Chile 591.
Coal	500	1,400	All to Uruguay.
Asphalt, natural, including asphaltite (raphaelite).	1,822	5,967	Paraguay 5,815.
Gas, natural and refinery, gaseous or liquefied.	538	517	Paraguay 501.
Petroleum:			
Crude	------	3,088	All to Paraguay.
Refinery products:			
Gasoline thousand 42-gallon barrels	(3)	4	Mainly to Paraguay.
Kerosine do	8	2	Mainly to United Kingdom.
Distillate fuel oil do	(3)	1,317	West Germany 741; Netherlands 229; United States 145.
Residual fuel oil do	5,703	6,402	United States 5,060; Canada 794.
Lubricants, including greases	254	232	Uruguay 173; Paraguay 28.
Other	1,070	2,081	Brazil 1,050; Uruguay 638; Paraguay 215.
Other products derived from coal, gas or petroleum.	1,279	308	Paraguay 215; Bolivia 57.

[1] Including concentrates containing significant amounts of silver.
[2] Mostly bars and rods but may include other semimanufactures.
[3] Less than ½ unit.
[4] Not reported by commodity. May be included with other nonmetals.
[5] May include small quantities of mineral pigments.

Source: Dirección Nacional de Estadística y Censos, Comercio Exterior Argentino, 1965 and 1966.

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Table 4.—Argentina: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	29,418	43,561	Australia 30,041; Guyana 12,030.
Alumina and aluminum hydroxide	5,178	7,203	Mainly from West Germany.
Metal and alloys, all forms	36,438	36,991	Italy 9,805; France 7,712; United States 6,174.
Antimony ore and concentrate	1,075	434	Peru 228; Bolivia 177.
Arsenic, white	334	489	West Germany 264; Sweden 143.
Bismuth	17	16	Mexico 8; Peru 8.
Cobalt:			
Oxides and hydroxides	6	10	Mainly from Belgium.
Metal	47	45	Do.
Copper and alloys, all forms	28,392	18,499	Chile 6,228; United States 5,321; West Germany 4,563.
Iron and steel:			
Iron ore—thousand tons	1,033	707	Mainly from Brazil.
Scrap—do	158	25	Mainly from United States.
Pig iron—do	142	243	U.S.S.R. 154; Finland 56.
Ferroalloys, including spiegeleisen	4,966	2,582	Republic of South Africa 664; Netherlands 572; Brazil 421.
Ingots and equivalent primary forms—thousand tons	609	330	United States 155; Venezuela 22.
Semimanufactures:			
Angles, shapes, sections—do	10	12	West Germany 4; Belgium 3; United Kingdom 2.
Bars and rods—do	558	29	Italy 7; United States 3; Japan 3.
Flat products:			
Uncoated—do		208	Brazil 58; United Kingdom 36; West Germany 29.
Coated:			
Tinned—do		108	United Kingdom 37; Japan 23; United States 18.
Other—do		2	Mainly from United States.
Rails and accessories—do	(1)	(1)	Do.
Wire—do	1	2	Do.
Pipes and tubes—do	9	10	Italy 4; United States 3.
Other—do	[2] 2	2	United States 1; West Germany 1.
Lead and alloys, all forms	3	22	Mainly from France.
Manganese:			
Ore and concentrate	13,042	20,246	All from Brazil.
Oxides	2,990	3,732	Mainly from United States.
Metal	(3)	17	United Kingdom 13; Japan 4.
Mercury—76-pound flasks	380	710	Mainly from Mexico.
Nickel and alloys, all forms	517	511	Canada 165; United States 152; Norway 97.
Precious metal and alloys, unwrought and semimanufactures—troy ounces	1,774	49,126	Mainly from United States.
Rare earth metals and compounds	8	15	Brazil 5; France 4; United Kingdom 4.
Selenium	7	7	Mainly from Canada.
Tin:			
Oxide—long tons	3	1	Mainly from United Kingdom.
Metal and alloys, all forms—do	1,319	1,471	Mainly from Malaysia.
Titanium:			
Ore and concentrate	(3)	909	Mainly from Australia.
Oxides	4,983	3,031	Mainly from United Kingdom.

See footnotes at end of table.

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Table 4.—Argentina: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Zinc and alloys, all forms	2,566	3,456	Belgium 1,397; Mexico 1,291.
Zircon concentrates	(3)	535	Australia 259; United States 93; Mexico 90.
Other:			
Ores and concentrates	1,669	1	All from United States.
Metals and alloys	[2] 1,080	268	United States 101; Norway 86.
Nonmetals:			
Abrasives, natural, except diamond	3,481	802	Uruguay 404; United States 186.
Asbestos	15,380	13,826	Canada 9,432; Republic of South Africa 4,073.
Barite	384	63	Mainly from United States.
Bromine	136	84	Mainly from Israel.
Cement	77	351	Uruguay 270; Italy 80.
Chalk	37	98	France 45; Switzerland 30.
Clays:			
Kaolin	9,361	10,663	United States 8,838; United Kingdom 1,588.
Refractory	32,502	373	United States 108; West Germany 98; France 97.
Other	27	25	United States 15; Netherlands 10.
Diamond, industrial:			
Stones—carats	99,610	60,000	United States 35,000; Brazil 25,000.
Powder—do	10,035	(4)	
Fertilizer materials:			
Nitrogenous:			
Natural	10,760	9,073	All from Chile.
Manufactured	46,791	15,592	West Germany 3,706; Italy 2,839; Belgium 2,693; United States 1,980.
Phosphatic	1,065	5,562	Netherlands 3,925; West Germany 1,233.
Potassic	483	3,568	West Germany 2,042; United States 1,301.
Mixed and nonspecified fertilizers	78,455	35,900	Netherlands 11,304; Italy 9,672; West Germany 6,786.
Graphite	339	346	Mainland China 180; West Germany 68.
Infusorial earths, including diatomite	(5)	2,777	Mainly from United States.
Iodine	41	24	Mainly from Chile.
Kyanite, andalusite, sillimanite	27	381	Mainly from India.
Lithium and its compounds	22	74	Mainly from United States.
Magnesite, crude and calcined	5,072	2,188	Austria 1,290; Brazil 780.
Mica	20	9	United Kingdom 5; United States 4.
Pigments, mineral	184	1	Mainly from United States.
Refractory brick and similar products	18,170	31,482	United States 7,632; West Germany 4,765; Philippines 4,572; Austria 4,519.
Sodium and potassium compounds, excluding salt:			
Caustic potash	1,706	979	West Germany 391; France 198; Belgium 140; United States 110.
Caustic soda	11,720	5,325	United States 1,384; Netherlands 830; United Kingdom 773; West Germany 712.
Sodium carbonate	130,756	127,656	Rumania 41,170; United Kingdom 21,542; France 18,841; West Germany 16,994.

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Stone, sand and gravel:				
Dimension stone, roughly worked		910	1,201	Brazil 610; Italy 485.
Gravel, crushed stone, and paving stones	thousand tons	348	444	Paraguay 239; Uruguay 205.
Sand	do.	506	698	Mainly from Uruguay.
Sulfur		45,251	35,541	Mainly from United States.
Talc		150	230	Italy 130; mainland China 25.
Other nonmetals		127	16,276	Mainly from Uruguay.
Mineral fuels:				
Asphalt, natural		161	228	Mainly from United States.
Carbon black		5,419	2,301	Do.
Coal	thousand tons	657	698	United States 425; Poland 273.
Coke	do.	82	52	West Germany 34; Italy 16.
Gas, natural and manufactured	do.	212	208	Venezuela 119; Chile 30; Kuwait 21.
Petroleum:				
Crude	do.	3,552	3,705	Nigeria 1,408; Venezuela 660; Iran 574; Iraq 533.
Refinery products:				
Gasoline	thousand 42-gallon barrels	548	211	Netherlands Antilles 163.
Kerosine	do.	103	1	Mainly from Paraguay.
Distillate fuel oil	do.	4,370	3,292	Mainly from U.S.S.R.
Residual fuel oil	do.	-------	103	Venezuela 64; Netherlands Antilles 32.
Lubricants, including greases	thousand tons	107	96	United States 50; Trinidad and Tobago 38.
Other	do.	1	1	Mainly from West Germany.
Other products derived from coal, gas, or petroleum, n.e.s.		912	47,995	Colombia 25,475; United States 16,384.

[1] Less than ½ unit.
[2] May include small quantities of manufactured items.
[3] Not reported by commodity. May be included under nonspecified ores and concentrates or metals and alloys.
[4] Quantity and source of imports valued at $30,964 were not reported.
[5] Not reported by commodity. May be included under other nonmetals.

Source: Dirección Nacional de Estadística y Censos, Comercio Exterior Argentino, 1965 and 1966.

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COMMODITY REVIEW

METALS

Aluminum.—The Instituto Nacional de Geología y Minería made an agreement with the Comisión Permanente de Planeamiento del Desarrollo de los Metales Livianos of the Argentine Air Force to carry out further exploration for bauxite deposits in Argentina. No commercial ores of aluminum have yet been found, and requirements were met by imports except for relatively small quantities of secondary aluminum, such as those recovered by Elaboradora de Metales SACIFA—Elmisa of Buenos Aires, for use in its extrusion plant. The Comisión continued to study the feasibility of establishing facilities in Chubut Province to produce aluminum from imported bauxite or alumina.

Copper.—The joint Argentine Government-U.N. Special Fund mineral prospecting project in the Andean regions of Neuquén, Mendoza, and San Juan Provinces engaged in geophysical studies and diamond drilling at several of the more promising of 53 previously discovered areas where indications suggesting mineralization of possible economic interest were found.

At Paramillos Norte, about 50 kilometers north-northwest of Mendoza, one drill hole intersected a 47-meter-wide zone averaging 1.86 percent copper (occurring as cuprite and delafossite) and 0.07 percent molybdenum. This section was believed to be an oxidized zone bordering a disseminated sulfide ore body which may be quite extensive judging from subsequent drilling and evidence of hydrothermal alteration in a 3- to 3.5-square-kilometer area.

At Paramillos Sud, about 5 kilometers south, induced polarization surveys indicated a mineralized area about 2,500 meters by 1,900 meters. Drill holes through up to 100 meters of overburden encountered two chalcosite impregnated zones bordering a central body of primary copper mineralization. The 10- to 40-meter-thick chalcosite zones have copper values of 0.7 to 1.2 percent. Early drill-hole samples from the primary ore body assayed 0.4 percent copper and 0.02 to 0.05 percent molybdenum.

In the Santa Clara district, in the higher ranges about 125 kilometers by road southwest of Mendoza, three areas showed intense copper-lead-zinc geochemical anomalies, and one also showed evidence of molybdenum mineralization. Preliminary drilling indicated disseminated-type mineralization with copper values as high as 0.6 percent.

Exploration of areas at Yalaguaraz, 150 kilometers northeast of Mendoza, and at Infiernillo, 40 kilometers west of San Rafael, had not reached the stage at which definitive evaluations could be made, but the former appeared more promising than the latter.

At yearend, Dirección General de Fabricaciones Militares began preparing a brochure summarizing results of the Argentine-United Nations investigations in an effort to solicit interest of mining organizations in undertaking further exploration and possible exploitation of promising areas. Reportedly, the Dirección intended to invite tenders for exploration concessions in the area prior to the scheduled June 1968 completion of the "Plan Perforaciones."

Iron Ore.—Virtually all 1967 iron ore output probably came from government-operated mines in Jujuy Province which normally supply ore to Establecimiento Altos Hornos Zapla at Palapalá. This plant produces less than 15 percent of Argentina's pig iron output. Approximately 822,900 tons of high-grade iron ore was imported to charge the furnace of the country's major pig iron producer, Sociedad Mixta Siderúrgica Argentina (SOMISA) at San Nicolás. Brazil supplied 729,700 tons, Chile 66,600 tons, and Peru 26,600 tons.

In continuing efforts to reduce imports of materials required to sustain the third largest iron and steel industry in Latin America, Argentine authorities have expended considerable effort and money to demonstrate the feasibility of exploring the Sierra Grande deposits in Río Negro Province. In 1967 the Dirección General de Fabricaciones Militares published a brochure outlining results of a feasibility survey and invited tenders for development or participation in development of these deposits. Reserves (measured, indicated, and inferred) are reported to be nearly 144 million tons of ore averaging about 55 percent iron and about 1.4 percent phos-

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phorous. There apparently was little immediate or satisfactory response, and the closing date for response was extended from December 15 to at least February 15, 1968. Major problems confronting potential developers include lack of adequate water and fuel supplies, surfaced roads, railroads, port facilities, etc. in the immediate vicinity; the necessity of underground mining to recover most of the ore; and the probability of having to fine-grind and pelletize ore because of its high phosphorous content. The Dirección estimated an investment of approximately $50 million would be required to develop facilities to produce and bulk-load 1 million tons of pellets per year for ocean and river transport to consumers in the Buenos Aires area.

Iron and Steel.—An 11-day shutdown in October 1966 and a 10-day shutdown in July 1967 to repair the single blast furnace of Argentina's largest steel mill, the Government-controlled General Savio plant at San Nicolás operated by SOMISA, were major factors contributing to the inability of the steel industry to match its 1965 record performance. Despite the July shutdown, a record monthly crude steel output of 132,000 tons was reportedly accomplished in August.

Instituto Latinoamericano del Fierro y el Acero (ILAFA) statistics indicate that 1967 hot-rolled product output included 538,000 tons of flat and 693,600 tons of nonflat products, as well as 95,300 tons of seamless pipe. The industry cold-rolled 221,887 tons of sheet and 9,047 tons of hoop and strip, made 8,911 tons of tinplate, and formed 121,156 tons of pipe and tubes other than seamless.

Centro de Industriales Siderúrgicos (CIS) estimated that domestic crude steel accounted for about 59 percent of total apparent 1967 consumption (including the crude steel equivalent of imported semimanufactures) compared with 61 percent in 1966 and 50 percent in 1965. CIS also estimated that local rolled products accounted for about 75 percent of total apparent 1967 consumption, compared with 78 percent in 1966 and 73 percent in 1965. This included an estimate for rolled steel included in imports of machinery, vehicles, and other iron and steel products.

Pig iron production capacity remained unchanged at 788,000 tons, but CIS reported crude steel capacity increased 105,000 tons to 1,759,000 tons through improvements in electric furnaces of Dalmine Siderca, S.A.I.y C., the installation of an electric furnace at the mill of Cura Hermanos, Industrias Metalúrgicas, S. A., and the addition of a new electric furnace at the Establecimientos Metalúrgicos "Santa Rosa," S. A., plant. Dalmine Siderca increased seamless pipe capacity by about 5,000 tons by putting into operation a reduction-drawing rolling mill. CIS indicated total finished hot-rolled product capacity decreased about 8,000 tons during the year to 2,425,000 tons, including 797,000 tons of flat products, 1,488,000 tons of shaped products, and 140,000 tons of seamless pipe.

Government action in 1967 on industry expansion projects allotted most of the targeted expansion to the Government's large integrated plant, SOMISA, and two of the larger privately owned steel companies, Propulsora Siderúrgica, S. A., and possibly Acindar, Industria Argentina de Aceros, S.A. The Government approved project proposals of these firms as well as those of two smaller firms, and reviewed plans of three others.

The SOMISA project to increase ingot capacity from 1.1 million to 2 million tons at a cost estimated at $195 million, including $114 million for imported equipment, will be in three phases. The first phase, to be completed by 1971 at a cost of $54.3 million, includes a 1,600-ton-per-day sintering plant, a powerplant, a pumping facility, and improvements in the billet mill, hot mills, and cold mills. The second phase (1972, $68.3 million) includes Linz-Donawitz type steel furnaces and continuous casting facilities for blooms and slabs. The third phase (1973, $72.4 million) includes additional coking facilities and a second blast furnace.

The Propulsora mill was under construction at the port of Ensenada. The first stage of the project is a 350,000-ton-per-year cold rolling mill, scheduled for completion in late 1969. The second stage includes a 1-million-ton hot rolling mill by late 1972, and the third stage comprises blast furnaces and crude steelmaking facilities (1,350,000 tons per year) by 1974. Propulsora will be accorded the tax treatment currently (1967) applicable to SOMISA, the privilege of importing raw materials duty free under certain conditions, and the granting of official guaran-

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tees of foreign exchange for machinery, equipment, and technical services.

Considerable opposition to certain aspects of the Propulsora and Acindar projects was generated by some smaller steel firms and in some Government circles. Although Propulsora proceeded more or less unhampered, Acindar expansion plans apparently were forstalled for an indefinite period; however, operation of Acindar's mills at Rosario and Villa Constitución was unaffected.

Lead and Zinc.—Argentina is self-sufficient in lead and must import only nominal amounts of zinc. Nearly all domestic zinc and the major part of domestic lead supplies are derived from the Aguilar mine of Cía. Minera Aguilar, S.A., an affiliate of St. Joseph Lead Co., in northwestern Jujuy Province. Most of the other lead is produced from the Gonzalito mine of Geotécnica, S.A., Comercio e Industria in Río Negro Province.

Aguilar reported it mined and milled roughly the same tonnage of ore as in 1966 but that output of lead concentrate exceeded the 1966 level of 34,700 tons largely because of higher lead content of ore mined. Zinc concentrate output remained close to the 1966 level of 52,000 tons. Exploration activity continued at an accelerated rate. In March the Government approved an expansion proposal and work was begun on the new mine and mill facilities. Aguilar will spend over $7 million to increase mine and mill capacity by at least 50 percent and perhaps by as much as 70 percent during 1968.

Aguilar has a 43.3 percent interest in the 11,600-ton-per-year electrothermic zinc smelter of Cía. Metalúrgica Austral at Comodoro Rivadavia and 50 percent in the 12,000-ton-per-year electrolytic smelter of Cía. Sulfacid, S. A., near Rosario. With the expansion at the Aguilar mine and mill, Sulfacid will proceed with plans for increasing zinc plant capacity, although no increase was indicated for the company's 40,000-ton-per-year sulfuric acid plant at Borghi that utilizes sulfur in Aguilar zinc concentrates.

Uranium.—Argentina's fourth atomic research reactor began operating in May at the Ezeiza nuclear research center of the Comisión Nacional de Energía Atómica (CNEA), near Buenos Aires. The 5,000-kilowatt reactor was designed and built entirely in Argentina and was planned specificially for commercial radioactive isotope production and research in foodstuff preservation by irradiation. It will also help train scientists and technicians for Latin America's first thermonuclear power station to be built at Atucha. Four U.S. and two West German firms and one each from Canada, United Kingdom, and Switzerland submitted proposals to CNEA for the installation of this power station, but no decision was reached by yearend.

NONMETALS

Cement.—The Argentine portland cement industry, 15 operating plants with a total capacity of 4.99 million tons, in 1967 exceeded a 3.5-million-ton output and sales level for the first time. Public works projects consumed 21.5 percent of cement deliveries in 1967, slightly higher than in 1966. Both official and private estimates indicate that cement consumption will increase markedly to satisfy demands of public works projects and plans for roads, power stations and housing. A 100,000-ton-per-year cement plant was under construction at Zapala in Neuquén Province to supply the requirements of the El Chocón-Cerros Colorados hydroelectric project, and annual capacity of another plant at Malagueño near Córdoba was being increased by 200,000 tons. In addition, the Government was considering a plan to raise the capacity of a large plant at Olavarría in Buenos Aires Province which would cost about $15 million, including $11 million for imported equipment.[2]

Sulfur.—In 1967 Fabricaciones Militares reportedly closed down sulfur mining at the Julia deposit in Salta Province, the source of most of the elemental sulfur recovered in Argentina in recent years. Although potential reserves are estimated to be at least several million tons of volcanic and caliche-type sulfur; geographic, technologic, and transportation problems apparently made recovery of domestic sulfur uneconomic compared with imports. Import duties on sulfur were reduced from 130 to 40 percent in March 1967, and the remaining sulfur producers may find it impossible to continue normal operations much longer.

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[2] Bank of London & South America Limited.

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MINERAL FUELS

Coal.—The Government entity, Yacimientos Carboníferos Fiscales (YCF) continued to increase output at the Río Turbio bituminous coal mines in Santa Cruz Province. Gross production for 1967 amounted to 686,000 tons yielding 412,200 tons of washed coal compared with gross output of 604,396 tons and washed output of 356,603 tons in 1966. YCF sales of coal soared 50 percent to 354,000 tons during 1967 with the principal consumers continuing to be Government electric powerplants, the national railways, and the SOMISA steel mill; however, SOMISA utilizes Río Turbio coal for less than 12 percent of its coking coal requirements.

A feasibility study was completed in 1967 and reportedly indicated that the Río Turbio mines might be able to expand annual gross output to over 1 million tons on a "reasonably economic" basis although their remoteness from consuming centers and high transportation costs continue as major problems. The Government was considering plans to reduce transport costs by acquiring more modern cargo vessels and improving port facilities at Río Gallegos. YCF reportedly will continue to receive a Government subsidy of approximately $14 million annually despite a 30-percent reduction in its total work force in 1967.

Petroleum.—The most significant developments in the Argentine petroleum industry during 1967 were a 9.5-percent increase in crude oil production and the enactment of a new hydrocarbons law granting concession rights to private Argentine and foreign companies. As a result of increased production, crude oil imports declined 29.3 percent. According to Yacimientos Petrolíferos Fiscales (YPF), the Government oil entity, the output increase was mainly the result of improved recovery techniques rather than new wells.

Provisions of the Hydrocarbons Law (No. 17319), promulgated on June 24, reversed the oil policy of the previous Government. The new law reaffirmed the absolute and inalienable rights of the state over all hydrocarbon deposits in national territories as well as the right to control exploitation and marketing of production, but it authorizes concessions to private firms and recognizes concessions made to foreign companies in the past. The former Government monopolies, YPF and Gas del Estado, will function on a basis similar to private companies; however, certain onshore areas are reserved exclusively for use of the state entities. The reserved areas include nearly all areas where the potential for oil production is reasonably well known, but present production contracts with private firms in these areas apparently will continue in effect, and others may be negotiated in the future.

Under the new law, concessions will be granted by the executive branch under the tender system. Exploration permits onshore will be granted for 9 years, divided into periods of 4, 3, and 2 years with a 50-percent reduction in concession area size after each period. Offshore permits will be for an additional year in each case. A 5-year extension may be granted with a further reduction in area. The law provides that a maximum area of 100,000 square kilometers onshore and 150,000 square kilometers offshore can be opened to concessions; these areas will be divided into units of 100 square kilometers, and individual concessionaires would be limited to five such units.

If oil is found, exploitation concessions will have a term of 25 years with a 10-year extension, and the maximum area, when not resulting from previous exploration concessions, will be 250 square kilometers. A limit of five such concessions may be granted to one company. Concessionaires will own the extracted hydrocarbons with the right to transport, commercialize, and industrialize them in accordance with the terms of the law and regulations to be established by the executive power. Gas del Estado will have first preference to purchase gas produced, and no export of hydrocarbons will be permitted until domestic needs are met. The government will fix commercial fuel prices, equal in amount for both state and private companies but not inferior to prices for imported petroleum of similar quality.

Surface taxes during the exploration period will rise from about $1.40 to $4 per square kilometer, with a much higher rate during a 5-year extension. A royalty of 12 percent will be collected on production of oil or gas, but may be reduced to 5 percent depending on productibility, conditions, and location of the well. Income tax is established at 55 percent of net profit, after deducting royalty, provincial and local taxes, and surface taxes during the explo-

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ration term. As an incentive to encourage bidding, companies receiving permits and concessions by yearend 1968 will benefit from a reduced tax rate of 47 percent for the first 10 years if operating offshore or 50 percent if operating onshore hydrocarbon deposits.

The first concessions to be offered under the new law were submitted for private bidding at the end of August. These included an offshore area of 40,000 square kilometers east of Bahía Blanca; an offshore area of 39,350 square kilometers east and south of Bahía Samborombón, about 200 kilometers southeast of Buenos Aires; and a contiguous onshore area of 18,700 square kilometers in the Río Salado region of the Province of Buenos Aires. In November, the Government received nine bids, representing 14 different companies, for concessions in these three areas. An announcement of concession awards was expected early in 1968.

The last remaining disputes arising from the annulment of petroleum contracts with private companies in 1963 were formally settled in April 1967. Pan American Argentina Oil Co. (Standard of Indiana) agreed to a settlement of $59 million, to be paid over a period of 9 years, in payment for crude oil delivered to but not paid for by YCF. In addition, Pan American was to continue its Argentine operations under a revised contract. Argentina Cities Service Development Co. settled for a sum of $14 million, to be paid over a period of 4 years, for crude oil previously delivered to YCF, and will also continue operations under a new contract.

Table 5.—Argentina: Production of crude oil and natural gas by Province

Province	Crude oil (thousand barrels)			Natural gas [1] (million cubic feet)		
	1965	1966	1967	1965	1966	1967
Santa Cruz	34,586	32,130	34,148	94,376	86,405	105,073
Mendoza	25,421	29,204	34,251	2,820	3,211	3,563
Chubut	19,061	17,981	19,499	13,726	13,271	15,440
Río Negro	5,878	13,187	15,797	------	6,256	9,798
Salta	5,404	4,737	4,149	90,264	85,724	79,315
Neuquén	4,891	4,229	4,357	16,465	12,847	12,854
Tierra del Fuego	3,035	3,291	2,474	2,586	2,863	2,376
Total [2]	98,276	104,760	114,673	220,236	210,576	228,419

[1] Gross withdrawal. Converted from cubic meters at rate of 1 cubic meter equals 35.3145 cubic feet.
[2] Data may not add to totals shown because of rounding.

Source: Dirección Nacional de Energía y Combustibles.

YPF accounted for 75.5 percent of total 1967 crude production with an output of 86.6 million barrels, an increase of 10.1 million barrels over 1966 output which was attributed largely to higher yields by fields in Mendoza Province. YPF production remained fairly steady during the first 9 months, averaging about 232,000 barrels per day, but began to increase during the fourth quarter and attained a daily average of 259,000 barrels during December. Pan American increased production from an average of about 22,600 barrels per day during the first quarter to about 32,700 barrels during the last 6 months. Pan American's increased output, representing 9.1 percent of total 1967 production, came mainly from exploitation of wells in Chubut Province that were acquired in April from YPF under terms of the company's renegotiated contract. Output in 1967 by Cities Service, the only other major producer (13.8 percent), decreased 9.2 percent as a result of normal depletion of the company's fields in Mendoza.

The YPF's 1967 drilling program called for 472 development wells and 141 exploratory wells. In its renegotiated contract with YPF, Pan American agreed to drill at least 150 wells in its contract area over the next 4 years provided suitable locations became available. Cities Service made a commitment to drill 60 wells in a 3-year period. Only a few contractor wells were drilled in 1967. Preliminary data indicated that drilling during 1967 totaled about 1.15 million meters with 610 wells being completed—430 oil producers, 45 gas wells, and 135 dry holes. In all, Argentina had 7,010 producing oil wells at yearend. Re-

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serves at yearend were estimated at 2,950 million barrels of crude oil and 8 trillion cubic feet of natural gas.

YPF embarked on a secondary recovery program following completion of its first secondary recovery studies in 1966. In September, YPF closed contracts with Homestake Production Co. and Ryder-Scott Co., associated with the Argentine firm of Bridas SAPIC, to recondition 170 wells in the Sauce and Cerro Bandera fields in Neuquén Province. Expected recovery from these wells by waterflooding is about 30 million barrels. YPF also has built pilot plants for water injection in the Barrancas field in Mendoza and the Cañadón León field in Santa Cruz Provinces which were studied by Ryder-Scott. In addition, YPF concluded contracts with Bolland and Co. for secondary recovery technical studies in eight oilfields and with Geopetrol of France for studies in two fields.

At the beginning of 1967, YPF had 22 seismic crews, two gravimeter crews, five geological crews, and eight topographical crews in the field, all onshore. During the year, YPF had a program under way to convert from seismographic reflection to the magnetic analog system, and a computer unit to assist in handling data was installed in Buenos Aires. During 1968, YPF plans to spend about $40 million on exploration and drilling activities of its own. In addition to drilling, it plans to undertake a gravity survey, seven geologic and nine topographic surveys, 22 seismic surveys, and an aeromagnetic survey covering about 127,000 square kilometers.

Total refinery throughput capacity at the beginning of 1967 was about 440,300 barrels per day. YPF owned about 60 percent of the total and accounted for the same percentage of the total 1967 refinery runs of 131,142,658 barrels. Runs of domestic crude increased by approximately 8.8 million barrels whereas those of imported crude decreased by 7 million barrels.

YPF, Esso, and Shell all had refinery expansion and modernization projects underway in 1967. At YPF's La Plata refinery, cracking and topping capacity was being enlarged by Japan Gasoline Co., and Lummus (of France) was providing new primary distillation units. YPF also has plans to build a 200,000-cubic-meter-per-year lubricating oil plant at La Plata, the largest such facility in South America. Expansion of YPF's Luján de Cuyo refinery was to be started in 1968, as was the expansion of propane adsorption units at Campo Durán.

Bechtel Corp. of San Francisco will be the principal contractor for the construction of a new 666-kilometer products pipeline from the Luján de Cuyo plant to Córdoba. This pipeline is linked with the building of new facilities at the plant to process the highly paraffinic Mendoza crudes.

It was reported that Gas del Estado plans to extend the southern gas pipeline 600 kilometers farther south and was negotiating with Bolivia for the purchase of substantial quantities of natural gas to permit full utilization of the northern gas pipeline from Campo Durán to Buenos Aires. The company also was planning to build a liquids extraction plant near San Lorenzo with a natural gas capacity of 5 million cubic meters daily, and a 504,000-barrel liquefied-petroleum gas bulk storage plant near the La Plata refinery along with additional tanker loading and unloading facilities on the access canal to Dock Sud.

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The Mineral Industry of Australia

By Lester G. Morrell [1]

The spectacular growth of Australia's mineral industry continued through 1966 and 1967 with value of mineral output rising to $701 million [2] and $794 million, respectively. Generally favorable markets and prices have contributed, but this growth is primarily credited to Australia's emergence as an important supplier of iron ore, bauxite, and manganese ore. In both years annual increases were recorded in a majority of the 60-odd commodities produced. According to national indicators, the value of minerals produced and initially processed during 1966 represented 3.6 percent of the gross national product. However, mineral raw materials provide the base for a wide range of manufacturing and related secondary industries.

The Australian Bureau of Mineral Resources, has pointed out Australia's full self-sufficiency in 27 of the 37 principal mineral products regarded as essential to the country's needs.[3] Major dependence upon foreign supplies is confined to petroleum, certain fertilizer materials, chromite, nickel, and several nonmetallics. With a limited, but steadily increasing domestic market, value of mineral product exports have totaled more than half the value of minerals produced since 1965. Also since 1965, the balance of minerals trade has reversed to "favorable" status. Existing long-range contracts with Japanese and other consumer markets justify anticipated further increases in mineral exports to values in excess of $1 billion annually, with corresponding benefits to foreign exchange earnings, by the mid-1970's.

The value of mineral output and value of mineral industry products, including primary processing and byproducts, for recent years, is shown in the following tabulation:

Year	Value, million dollars	
	Mine output	Total, including domestic primary treatment
1963	466.6	631.3
1964	551.3	746.5
1965	606.6	816.6
1966	700.8	970.2
1967	794.3	e 1,055.0

e Estimate.

In 1966, the most recent year for which details are available, the 10 leading mineral products accounted for 90 percent of the total value of Australia's mineral output. In descending order the list included the following, with value in million U.S. dollars: Black (bituminous and subbituminous) coal 169.5, copper in ores and concentrates 97.2, construction materials 93.5, lead in ores and concentrates 86.2, iron ore 46.3, zinc in ores and concentrates 36.8, beach sands (including rutile, zircon and ilmentite) 33.6, gold 29.6, brown coal 22.5, and tin in concentrates 16.0. The value added through primary treatment was estimated at $269.3 million in 1966, of which iron and steel making accounted for $147.1 million, alumina and aluminum $40.9 million, and base metals (copper, lead, zinc, and tin) smelting and refining $81.3 million.

Exclusive of operations employing fewer than four persons, 900 mines and quarries were operated during 1966, including 161

[1] Chief area specialist, North America-South Pacific, Division of International Activities.

[2] Unless otherwise indicated, values have been converted from Australian dollars (A$) to U.S. dollars at the rate of A$1=US$1.12.

[3] Bureau of Mineral Resources, Geology and Geophysics. Australian Mineral Industry, 1966 Review. Canberra, A.C.T., Australia, 1967, pp. 312.

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metal mines, 162 coal mines, 149 nonmetal operations, and 428 construction material quarries. The mines and quarrying industry, exclusive of operations with less than four employees, employed 47,777 persons and salaries and wages paid to workers totaled A$169.6 million. During the past 5 years, trends have been to fewer mines (951 in 1962), more employees (45,225 in 1962) and substantially greater payrolls (A$119.4 million in 1962).

Reflecting mine and quarry expansion and modernization, expenditures on additions and replacements to fixed assets as summarized by the Commonwealth Statistician [4] totaled $165.7 million in 1966, compared with $121.2 million in 1965 and $86.5 million in 1964. In each year metal mining facilities were the principal recipient (55 to 60 percent) with about one-third going to coal mining. Expenditures by private enterprise on petroleum exploration and development in 1966 totaled $65.8 million, compared with $62.6 million in 1965 and $43.9 million in 1964.

Commonwealth Government financial assistance to the minerals industry distributed by industrial sector, has been as follows:

	Value, thousand dollars		
	1965	1966	1967
Petroleum exploration [1]	11,663	11,374	11,549
Gold mining [2]	2,223	4,238	4,322
Sulfuric acid production [3]	2,396	1,566	1,548
Phosphate fertilizer production [4]	25,318	28,916	28,609
Total	41,600	46,094	46,028

[1] Petroleum Search Subsidy Act.
[2] Gold Mining Industry Assistance Act.
[3] Sulfuric Acid Bounty Act.
[4] Phosphate fertilizers Bounty Act.

Many important developments during 1966 and 1967 marked these as outstanding years in Australia's mineral industry. In fulfillment of long-term contracts with Japanese steel mills, three companies, Western Mining Corporation, Goldsworthy Mining Pty. Ltd., and Hamersley Iron Pty. Ltd., commenced iron ore shipments from newly developed deposits in Western Australia early in 1966. The 600,000-ton-per-year alumina plant of Queensland Alumina Ltd., at Gladstone, was commissioned in March 1967, and in May the company announced plans to raise capacity 50 percent by late 1968. To meet the raw material requirement of this plant, annual bauxite production capacity at Weipa was raised to 3 million tons early in 1967. Construction was started on the Alcan Australia Ltd. aluminum smelter at Kurri Kurri, New South Wales, and concessions to exploit extensive bauxite deposits on the Gove Peninsula were finalized during the year. In Western Australia, capacities of the Alcoa of Australia bauxite mines at Jarrahdale and the alumina plant at Kwinana were vitrually doubled during 1966–67 in a first phase of expansion to 830,000 tons alumina annually by late 1969.

Following an energetic development program, Western Mining Corporation Ltd. commenced nickel concentrate production at Kambalda, Western Australia, in June 1967. This venture's success generated a rush to acquire leases in nearby areas and a nationwide search for nickel.

Manganese ore export controls were lifted in January 1966, and Western Australia producers promptly negotiated contracts with Japan and increased production. Later in 1966, manganese ore shipments from deposits on Groote Eylandt were started by Broken Hill Proprietary Co. Ltd.

The long, nationwide search for an indigenous phosphate rock supply was rewarded in 1966 with the discovery of hundreds of millions of tons near Duchess, northwestern Queensland, by Broken Hill South Ltd.

Developments in oil and gas moved ahead rapidly during 1966–67. Highlights were first oil production from Barrow Island, Western Australia, discovery of gasfields at Marlin, Victoria; Momba, South Australia; and Dongara, Western Australia. Interest in offshore areas was evidenced by five units operating by mid-1967 in coastal waters. Drilling on the Gippsland Shelf, off southeast Victoria, has considerably increased oil and gas reserves in that area and contracts have been let for gas pipelines to Melbourne.

[4] Commonwealth Bureau of Census and Statistics. Statistical Bulletin: Mining and Quarrying, No. 15, 1966, Canberra, Australia, July 1966, pp. 61.

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PRODUCTION

Preliminary figures for 1967 indicate continued growth in both value and volume of Australia's mineral production. Estimates by the Commonwealth Government showed metallic mineral output valued at $433 million. Nonmetallic and construction materials production was valued at $134 million while fuels output was $227 million.

Geographically, New South Wales kept its lead as the chief mining state with 38.7 percent of the nation's total value of mineral products. The opening of new iron ore, bauxite, manganese, and nickel mines enabled Western Australia, with 20.3 percent of the total, to displace Queensland as the second-ranked state. In spite of increased production of coal for export and the new bauxite and alumina developments, Queensland's share fell to 19.2 percent. Victoria in 1967 accounted for 8.0 percent, South Australia 5.7 percent, Tasmania 5.3 percent, and Northern Territory 2.8 percent of the national total.

Table 1.—Australia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Aluminum:					
Bauxite	359,891	r 796,482	r 1,186,412	1,827,123	4,236,076
Alumina	47,094	160,659	202,446	306,970	854,420
Refined metal	41,925	80,008	87,765	91,863	92,395
Antimony (in antimony and lead concentrates)	r 1,023	r 1,134	r 959	987	e 900
Beryl	112	113	40	53	42
Bismuth (in ore)kilograms	----------	----------	----------	325	----------
Cadmium, refined metal	494	502	r 524	526	524
Chromite	163	73	r 23	----------	----------
Cobalt (in zinc concentrate)	87	74	91	97	e 100
Columbium and tantalum concentrate	14	15	r 12	5	23
Copper:					
Ore and concentrate (content)	114,780	105,720	r 91,839	111,014	89,075
Blister (primary)	89,912	81,882	74,592	91,939	74,506
Refined (primary)	r 87,497	r 81,199	60,918	91,404	67,090
Goldtroy ounces	1,023,970	963,834	r 877,643	915,797	672,171
Iron and steel:					
Iron orethousand tons	5,603	5,759	6,803	11,608	18,814
Pig irondo	r 3,688	r 3,993	r 4,251	4,743	5,057
Ferroalloys: [1]					
Ferrochromium, high carbon	1,112	2,480	1,358	1,781	NA
Ferromanganese and silicomanganese	38,937	r 47,997	56,901	56,335	NA
Ferrosilicon	r 8,334	5,095	4,475	4,476	NA
Steel ingots and castings thousand tons	4,653	r 5,047	r 5,462	5,890	6,201
Steel semimanufactures [1]do	2,869	3,606	r 4,615	4,607	NA
Lead:					
Ore and concentrate (content)	416,876	380,872	367,949	370,789	378,195
Refined (primary)	228,210	206,360	196,409	196,228	194,030
Bullion, for export	81,956	79,561	67,981	75,487	97,111
Manganese ore, all grades	36,640	62,090	103,557	282,462	e 550,000
Molybdenum, in ore and concentrate	6	----------	12	2	----------
Monazite concentrate	r 2,096	2,013	r 2,342	2,007	2,638
Nickel, in ore and concentrate	----------	----------	----------	----------	e 1,000
Platinumtroy ounces	4	----------	----------	13	NA
Selenium (in refinery slimes) [e] kilograms	1,590	1,590	2,380	2,000	NA
Silver:					
Ore and concentrate (content) thousand troy ounces	19,642	18,427	r 17,281	18,876	19,765
Refineddo	8,887	9,258	r 8,696	8,864	9,771
Tellurium (in refinery slimes) [e] kilograms	900	1,600	----------	----------	NA
Tin:					
Ore and concentrate (content) long tons	2,860	3,642	r 3,849	4,383	5,379
Smelterdo	2,626	3,021	r 3,179	3,640	3,594
Titanium concentrates:					
Ilmenite	r 204,765	308,501	r 448,113	521,249	547,723
Rutile	186,201	185,298	r 220,818	251,472	279,377
Tungsten ore and concentrate (W content)	774	802	948	1,053	956
Uranium oxide (U_3O_8) [e]	1,100	r 335	335	300	300

See footnotes at end of table.

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Table 1.—Australia: Production of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals—Continued					
Zinc:					
Ore and concentrate (content)	357,111	350,131	r 354,836	375,262	404,408
Smelter	182,662	188,509	202,182	197,530	197,593
Zirconium concentrate	187,797	187,037	r 230,504	248,078	297,031
Nonmetals:					
Asbestos:					
Chrysotile, fibre and fines	748	r 1,602	r 1,063	569	534
Crocidolite	11,385	r 10,785	9,428	11,642	----------
Barite	8,352	12,499	r 12,168	13,943	14,530
Cement—thousand tons	3,119	3,626	3,802	3,674	3,817
Clays:					
Bentonite and bentonite clay	1,555	1,015	r 1,220	852	NA
Brick clay and shale—thousand tons	4,622	5,164	r 5,137	5,478	NA
Cement clay and shale—do	r 234	282	r 257	239	NA
Damourite clay	500	576	685	624	NA
Fire clay—thousand tons	208	225	237	291	NA
Kaolin and ball clay—do	45	46	62	51	NA
Stoneware and tile clay—do	423	494	r 443	440	NA
Other—do	96	12	24	26	NA
Diatomite	5,927	8,872	r 7,070	7,228	e 3,700
Feldspar	8,984	9,157	8,864	7,376	e 5,000
Fertilizer materials: Phosphate rock	5,004	5,780	4,592	5,807	e 12,000
Fluorspar	15	r 50	r 45	30	----------
Fuller's earth	276	162	90	----------	NA
Gem stones e—value, thousands	$2,922	$3,469	$4,404	$4,653	NA
Gypsum	r 698,350	r 799,126	846,898	813,026	787,000
Lime [2]	106,283	102,872	161,201	151,902	NA
Lithium minerals [3]	438	264	315	1,009	678
Magnesite	57,860	31,752	r 26,785	19,870	e 22,000
Pyrites, including cupreous pyrites	197,158	223,610	207,285	249,946	e 270,000
Salt—thousand tons	591	554	665	655	NA
Talc and soapstone	14,167	r 17,033	r 19,695	21,710	e 19,000
Mineral fuels:					
Coal:					
Bituminous [4]—thousand tons	25,255	27,841	31,937	33,869	35,267
Lignite (brown coal)—do	18,753	19,340	r 20,090	22,135	23,762
Coke:					
High-temperature—do	2,896	3,092	3,096	3,235	3,651
Low-temperature [5]	r 809	r 779	r 749	e 650	NA
Fuel briquets—do	1,917	1,885	1,935	1,889	1,873
Natural gas—million cubic feet	96	106	144	143	152
Petroleum:					
Crude—thousand 42-gallon barrels	----------	1,491	2,622	3,390	7,594
Refinery products:					
Gasoline—do	35,089	40,809	43,901	46,704	52,826
Kerosine and jet fuels—do	3,673	4,459	4,224	5,778	7,232
Distillate fuel oil—do	20,369	19,549	20,095	22,041	25,844
Residual fuel oil—do	32,151	33,493	34,580	37,929	40,737
Lubricants—do	551	1,400	1,805	1,868	2,291
Other products—do	4,767	5,366	7,523	8,648	8,591
Refinery fuel and loss—do	9,435	9,809	11,441	12,373	13,415
Total—do	106,035	114,885	123,569	135,341	150,936

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Ferroalloys and steel semimanufactures are reported for fiscal years ending November 30.
[2] Year ended June 30 of year stated.
[3] Petalite, amblygonite, and spodumene.
[4] Includes semianthracite and subbituminous.
[5] Includes coke breeze.

TRADE

Mineral commodities [5] accounted for 17 percent of total Australian merchandise exports and 14.6 percent of total imports recorded during the 1965–66 Australian fiscal year. Mineral commodity exports were valued at $490.2 million in 1965–66. Metallic minerals and metals made up 78.2 percent of the total; nonmetals accounted for 2.5 percent, and fuels constituted 19.3 percent. Leading export items and their value in millions of U.S. dollars were as follows: Lead (bullion and refined) $74.2, coal $70.7, steel semimanufactures $64.4, beach sand products (ilmenite,

[5] Includes commodities listed in tables 2 and 3.

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rutile, zircon) $32.6, copper (blister and refined) $30.8, zinc $30.2, and gold $27.0.

The value of mineral commodity imports in the same period totaled $475 million, of which metallics, nonmetals and fuels comprised 25.9, 14.2, and 59.9 percent, respectively. Principal items and values in millions of U.S. dollars were crude petroleum $222.8, steel semimanufactures $88.1, refined petroleum products $56.8, fertilizer materials $32.8, sulfur $10.3, asbestos $7.1, and ferroalloys $6.8.

Table 2.—Australia: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1964–65	1965–66	Principal destinations, 1965–66
Metals:			
Aluminum:			
Bauxite	518,144	---	
Scrap	598	1,512	Japan 910; United States 220; West Germany 219.
Unwrought	22,313	19,079	United States 7,710; United Kingdom 4,019; Netherlands 2,585.
Semimanufactures	643	2,379	Canada 1,166; United Kingdom 341; New Zealand 251.
Beryllium ore and concentrate	87	62	All to United States.
Cadmium, refined metal [2]	380	503	United Kingdom 217; United States 162.
Copper:			
Ore and concentrate, gross weight	46,611	42,634	Japan 42,475.
Blister, cement, etc	169	5,638	All to Japan.
Scrap	905	2,646	Japan 1,083; West Germany 560.
Ingots, blocks, billets [2]	2,171	26,844	Netherlands 10,265; United Kingdom 6,320; United States 4,963.
Semimanufactures	3,304	16,535	New Zealand 5,514; West Germany 3,391; United States 2,635.
Pipe, tubes, and wire	1,369	2,984	New Zealand 1,527; West Germany 497; Netherlands 341.
Gold:			
Ore and concentrate, troy ounces content. [4]	r 50,588	83,533	NA.
Crude bullion, content ---do---	157	1	NA.
Mint bullion ---do---	576,575	768,702	All to Hong Kong.
Sheet, strip, dust ---do---	8,274	9,625	New Zealand 8,467.
Iron and steel:			
Iron ore and concentrate	98,202	343,279	Japan 333,735.
Iron pyrites and cinder	75,098	71,195	Japan 57,135; Taiwan 14,060.
Scrap	374,404	269,314	Japan 240,699; Taiwan 17,309.
Pig iron	60,672	50,630	New Zealand 7,201; United States 5,663; West Germany 5,599.
Steel ingots, blooms, slabs, etc	r 5,953	82,040	Spain 30,763; Phillippines 16,938; Hong Kong 11,655.
Steel semimanufactures	347,979	482,667	New Zealand 222,897; United States 46,483.
Lead:			
Ore and concentrate, gross weight	103,569	120,151	United States 46,584; Japan 32,900; Belgium-Luxembourg 23,741.
Refined, unwrought	153,637	162,374	United Kingdom 78,361; United States 46,154.
Bullion, lead and silver-lead	59,156	90,551	United Kingdom 67,735; Netherlands 12,699.
Semimanufactures	5,570	5,563	New Zealand 3,141; Japan 835; Philippines 635.
Manganese ore	55,615	70,139	Japan 63,253.
Monazite concentrate	2,172	2,369	United States 1,300; France 437; West Germany 354.
Platinum-group metals:			
Ore and concentrate [3], kilograms gross weight.	r 21,232	7,277	United Kingdom 4,487; undisclosed 2,770.
Platinum metals [3] ---troy ounces	1,262	1,538	Hong Kong 927; United Kingdom 366.
Silver:			
Ore, concentrate, crude bullion, content [4]. thousand troy ounces	8,305	NA	
Mint bullion ---do---	1,367	247	All to United Kingdom.
Sheet, strip, dust ---do---	92	178	New Zealand 165.
Tantalite-columbite concentrate	48	7	United States 4; Netherlands 2; United Kingdom 1.
Tin:			
Ore and concentrate, gross weight. long tons	1,254	2,019	United Kingdom 1,756.
Unwrought ---do---	39	15	Undisclosed 8; New Zealand 6.

See footnotes at end of table.

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Table 2.—Australia: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1964–65	1965–66	Principal destinations, 1965–66
Metals—Continued			
Titanium concentrates:			
Ilmenite, minimum 45 percent TiO_2.	280,316	395,545	United Kingdom 206,431; United States 82,448.
Rutile, minimum 90 percent TiO_2.	245,548	238,116	United States 132,638; Japan 20,492.
Tungsten concentrates:			
Scheelite	1,753	1,321	West Germany 529; United Kingdom 230; Japan 188.
Wolframite	367	569	United States 325; United Kingdom 171.
Zinc:			
Ore and concentrate, gross weight	206,317	247,756	United Kingdom 177,511; Japan 39,043.
Ingots, blocks, slabs, etc	86,016	100,774	United Kingdom 21,704; India 16,487 United States 15,305.
Semimanufactures	2,228	891	Philippines 501; New Zealand 217.
Other forms	135	225	New Zealand 65; Japan 61.
Zircon concentrate, minimum 30 percent $ZrSiO_4$.	216,382	224,541	United States 51,487; United Kingdom 39,153; France 33,740.
Nonmetals:			
Abrasives:			
Industrial diamond [3] carats	70,573	44,159	United Kingdom 35,892.
Other natural abrasives	82	104	Undisclosed 58; New Zealand 46.
Asbestos, crude and fibre [5]	6,567	3,983	Malaysia 896; Japan 581; Singapore 493.
Cement, construction types	3,956	2,738	Nauru 1,394; Christmas Island 789.
Clay, fire, sillimanite and others	1,990	2,949	United Kingdom 1,145; Japan 1,094.
Gem stones:			
Diamond [3] carats	3,006	2,334	New Zealand 926; Belgium-Luxembourg 679; United Kingdom 501.
Opal [3] value, thousands	$5,551	$6,856	Japan $3,223; United States $1,214; Hong Kong $1,214.
Other, cameo, intaglio do	$430	$979	United Kingdom $452; France $170.
Graphite	20	22	NA.
Gypsum	169,228	187,409	New Zealand 107,323; Malaysia 29,204; Taiwan 28,128.
Magnesite	2,614	2,306	United States 970; New Zealand 426.
Mica, crude	33	29	NA.
Salt	113,463	102,936	Japan 83,603; New Zealand 12,941.
Stone, construction value, thousands	$13	$35	Undisclosed $26; New Zealand $9.
Talc and steatite	5,135	9,992	Netherlands 4,818; Sweden 2,162.
Mineral fuels:			
Coal thousand tons	6,160	7,777	Japan 7.315; New Caledonia 240.
Coke and semi-coke	108,463	112,202	New Caledonia 99,840; Philippines 7,830.
Petroleum refinery products:			
Gasoline, total thousand 42-gallon barrels	483	454	New Zealand 283; Philippines 137.
Kerosine and jet fuel do	507	594	New Zealand 341; Fiji 222.
Distillate fuel oil do	1,891	1,366	Singapore 503; New Zealand 292; Mozambique 231.
Residual fuel oil do	5,369	3,839	Singapore 1,316; New Caledonia 1,073; Japan 910.
Lubricants do	461	443	New Zealand 241; South Africa 143.
Other products do	98	108	New Zealand 87.

NA Not available.
[1] Periods shown are fiscal years July 1 to June 30.
[2] Data not available on quantities of cadmium exported in lead and zinc concentrates.
[3] Includes reexports.
[4] Quantities given are for 1964 and 1965 calendar years, respectively.
[5] Mostly crocidolite.

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Table 3.—Australia: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1964–65	1965–66	Principal sources, 1965–66
Metals:			
Aluminum:			
Scrap, includes alloys	1,001	996	New Zealand 328; Canada 199; Fiji 155.
Pigs, ingots, blocks, etc	331	396	United Kingdom 195; United States 186.
Semimanufactures [2]	1,602	3,465	United Kingdom 1,553; United States 820.
Pipe, tubes, powder, wire [2]	1,243	381	West Germany 104; United Kingdom 96; United States 52.
Antimony:			
Ore and concentrate, gross weight	21	------	
Metal	255	189	Mainland China 182.
Bismuth metal	11	8	United Kingdom 5; Japan 2; Mexico 1.
Chrome ore and concentrate	29,388	12,233	Rhodesia, Southern 7,122.
Cobalt and cobalt base alloys	51	53	Zambia 33; Belgium-Luxembourg 9; Congo (Kinshasa) 6.
Copper:			
Ore and concentrate	10	932	Canada 924.
Scrap	534	143	Papua-New Guinea 84; Solomon Islands 46.
Ingots, blocks, billets	18,621	935	United States 925.
Semimanufactures [2]	2,449	1,392	United Kingdom 506; undisclosed 886.
Pipe, tubes, powder, wire	506	920	Japan 408; United Kingdom 309.
Gold:			
Ore and concentrate, gross weight	------	6	All from Fiji.
Crude bullion, gold troy ounces content [2]	128,778	147,016	Fiji 107,049; Papua-New Guinea 39,659.
Refined bullion do	1,032	50,732	West Germany 47,355.
Iron and steel:			
Ore and concentrate, includes pyritic materials.	281,950	288,315	New Caledonia 288,112.
Scrap	535	1	NA.
Ferroalloys:			
Ferrochromium	3,358	3,259	Rhodesia, Southern 1,174; Sweden 624; Japan 559.
Ferromanganese [2]	9,728	11,866	Republic of South Africa 9,191; Japan 1,859.
Ferromolybdenum	185	248	Belgium-Luxembourg 97; United States 91.
Ferrosilicon	8,727	10,534	Norway 5,044; Republic of South Africa 4,682.
Ferronickel	1,378	1,097	New Caledonia 1,057.
Other	1,927	1,599	Rhodesia, Southern 605; Republic of South Africa 294; Japan 222.
Ingots, blooms, etc [2]	57,339	6,422	Japan 5,318; United Kingdom 785.
Semimanufactures [2] rolled or drawn.	value, thousands $104,689	$69,716	Japan $31.984; United Kingdom $18.216.
Pipes, tubes, castings and forgings.	do NA	$18,352	Japan $5,856; United Kingdom $5,528; United States $2,565.
Lead and lead base alloys [2], includes semimanufactured forms and pipe.	447	72	United Kingdom 20; United States 14.
Magnesium and magnesium base alloys	463	900	United States 385; Canada 254; Norway 206.
Molybdenum and vanadium ores and concentrates.	5	22	United States 18.
Manganese ore:			
Battery grade	8	1,296	Ghana 996; mainland China 300.
Metallurgical grade	74,509	33,596	New Hebrides 16,257; Republic of South Africa 14,949.
Mercury 76-pound flasks	2,681	1,345	Spain 683; Mexico 160.
Nickel:			
Matte and other crude forms	1,432	463	Canada 434.
Pigs, ingots, granulated	1,272	987	United Kingdom 429; Canada 437; Norway 121.
Bars, rods, anodes, powder [2]	568	537	Canada 408; United Kingdom 117.
Platinum-group metals [2] troy ounces	3,792	17,839	United Kingdom 17,684.
Silicon metal value, thousands	$217	$159	Japan $131; Sweden $20.
Silver:			
Crude bullion, silver troy ounces content.	89,417	88,374	Fiji 61,299; United Kingdom 24,938.
Refined bullion do	2,807	10,310	All from New Zealand.
Tin and tin base alloys long tons	1,788	511	Malaysia 447; mainland China 60.
Tungsten and tungsten base alloys	31	18	United Kingdom 6; Canada 6; France 4.
Zinc:			
Ore and concentrate	NA	5,165	All from Iran.
Zinc and zinc base alloys	278	142	United Kingdom 103.
Zirconium ore and concentrate	NA	8	NA.

See footnotes at end of table.

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Table 3.—Australia: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1964–65	1965–66	Principal sources, 1965–66
Nonmetals:			
Abrasives:			
Industrial diamond.....carats	416,080	445,597	Republic of South Africa 263,478; United Kingdom 79,005; United States 59,330.
Pumice and tripoli	1,573	1,145	United States 506; New Zealand 488.
Garnet	130	94	United States 74.
Flintstone and pebbles	1,545	356	NA.
Arsenic trioxide	1,757	1,217	Sweden 819; France 312.
Asbestos:			
Chrysotile	31,358	36,960	Canada 36,341; Republic of South Africa 402.
Amosite	7,756	9,296	Republic of South Africa 8,302; Canada 680.
Other	2,582	2,405	Canada 1,944; United Kingdom 379.
Barite, ground and unground	2,243	1,450	Mainland China 850; United States 303.
Boron minerals, crude and concentrate	1,313	1,900	United States 1,899.
Cement, construction types [2]	62,430	69,110	Taiwan 21,603; United Kingdom 20,492; Japan 18,675.
Clays:			
China, kaolin, pottery	20,924	27,397	United Kingdom 20,606; United States 6.710.
Fire and ball	8,101	7,814	United States 3,439; United Kingdom 2.264; Republic of South Africa 2,027.
Bentonite	15,191	16,031	United States 15,474.
Other [2]	12,985	8,765	United States 8,185.
Cryolite, natural and synthetic	3,532	136	All from Denmark.
Diatomite and other earths	5,882	5,109	United States 5,043.
Fertilizer materials:			
Nitrogenous:			
Sodium nitrate natural	1,176	5,810	Chile 5,784.
Manufactured nitrogenous fertilizers.	84,305	68,360	Canada 25,886; United States 14,257; Belgium-Luxembourg 7,954.
Phosphatic:			
Phosphate rock. thousand tons	2,558	2,840	United States 826; Christmas Island 798; Nauru 747.
Other manufactured phosphatic materials.	NA	270	Japan 244.
Potassic:			
Potassic salts, natural	-------	18	NA.
Manufactured potassic materials.	110,773	109,868	United States 83,477; France 11,645.
Other and mixed fertilizers [2]	42,198	16,438	West Germany 10,266; United States 3.348.
Flurospar	8,565	15,778	United Kingdom 6,342; Republic of South Africa 4,769; mainland China 3,552.
Gem stones:			
Gem diamond.....carats	35,237	31,747	Republic of South Africa 11,326; Belgium-Luxembourg 9,938; Israel 4,235.
Pearls and other precious and semi-precious. value, thousands	NA	$1,457	Japan $566; India $234.
Cameos.....do	$1,465	NA	
Gypsum, crude and calcined	NA	864	United Kingdom 419; United States 257.
Graphite:			
Colloidal	95	25	United Kingdom 20.
Flake	477	166	NA.
Crystalline	176	186	Ceylon 116.
Amorphous	820	878	Ceylon 333; mainland China 246.
Iodine, crude	4	9	Japan 8.
Iron oxide pigments [2]	6,328	8,613	West Germany 3,442; Spain 2,084.
Kyanite	1,805	978	India 644; United States 333.
Limestone	NA	198,851	Japan 198,846.
Lithopone	1,161	942	United Kingdom 357; West Germany 285; Netherlands 204.
Magnesite, crude, calcined and fused	42,342	22,378	Japan 9,652; United States 7,566; India 4,991.
Mica:			
Block or sheet	44	34	India 30.
Splittings	143	101	India 96.
Ground and scrap	1,042	725	Republic of South Africa 349; India 193; United Kingdom 108.
Phosphorus	887	444	United Kingdom 433.

See footnotes at end of table.

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Table 3.—Australia: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1964–65	1965–66	Principal sources, 1965–66
Nonmetals—Continued			
Quartz and quartzite	44	534	NA.
Salt	6,673	7,205	United Kingdom 6,105.
Sillimanite	341	1,008	NA.
Stone, construction [2]—value, thousands	$562	$493	Italy $382; Sweden $24.
Sulfur, elemental [2]	380,824	410,406	United States 189,243; Canada 178,787; Mexico 42,258.
Talc, steatite and chalk	2,378	11,547	France 7,005; United Kingdom 2,285; mainland China 1,416.
Vermiculite	2,923	2,585	Republic of South Africa 2,485.
Mineral fuels:			
Asphalt, bitumen and pitch:			
Natural minerals	494	3,770	Taiwan 2,337; Trinidad and Tobago 950; United States 452.
Petroleum bitumen	2,242	193	United Kingdom 149.
Coal tar and coal tar pitch	12,257	9,127	United States 8,997.
Carbon and carbon black [2]	4,056	4,733	United States 2,832; United Kingdom 1,860.
Coal, all types, includes briquets	9,429	8,656	Republic of South Africa 7,119; United States 1,490.
Coke and semicoke	52,316	56,302	United States 46,169; West Germany 10,132.
Peat	1,414	2,046	West Germany 1,623; Ireland 254.
Petroleum:			
Crude—thousand 42-gallon barrels	117,986	126,345	Saudi Arabia 16,074; Kuwait 5,786.
Refinery products:			
Liquefied petroleum gas—42-gallon barrels	NA	48	United States 31.
Gasoline—thousand 42-gallon barrels	6,635	6,816	Iran 3,787; Aden 1,058.
Kerosine and jet fuel [2]—do	1,911	2,090	Aden 624; Malaysia 438; Indonesia 325.
Distillate fuel oil—do	1,472	1,479	Japan 360; Malaysia 281; Singapore 232.
Residual fuel oil [2]—do	700	317	Malaysia 143; Singapore 140.
Lubricants [2]—do	926	506	United States 256; Netherlands Antilles 124; United Kingdom 68.
Petroleum turpentine—do	202	50	Iran 23; Malaysia 14; United States 7.
Other products [2]—do	464	781	Indonesia 342; United States 128.

NA Not available.
[1] Periods shown are fiscal years, July 1 to June 30.
[2] Owing to change in commodity classification system, data for 1965–66 do not compare precisely with those for previous years.

COMMODITY REVIEW

METALS

Aluminum.—Although the combined output of refined aluminum by Australia's two reduction plants set new national records in 1966 and again in 1967, the industry's outstanding recent developments have been in bauxite mining and alumina facility construction. Since 1965 annual bauxite output has more than tripled and alumina output has increased fourfold.

Australia's bauxite resources, estimated at around 3.5 billion tons, are considered to approximate one-third of the world's supply. The three major Australian deposits are at Weipa, on York Peninsula in Queensland, (2.5 billion tons); in the Darling Ranges, Western Australia (over 500 million tons); and at Gove, on the west side of Gulf of Carpentaria in Northern Queensland (200 million tons). Two of these deposits were being exploited in 1967—Weipa by Commonwealth Aluminum Corporation Ltd., and Darling Ranges by Alcoa of Australia Pty. Ltd.

The Gove deposits, following extensive field studies and development program negotiations, were assigned in February 1968 to Nabalco Pty. Ltd., a consortium of Swiss and Australian companies. Plans call for mining 1 million tons of bauxite annually and construction of a 500,000-ton-per-year alumina plant, townsite, and shipping port with production to commence by 1971.

By mid-1967 completion of new facilities at Weipa raised annual bauxite capacity

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to 3 million tons and provided for future expansion to 5 million tons. The port access channel was deepened to accomodate 60,000-ton ships and loading equipment capable of 3,000 tons per hour was provided. Further plans for Weipa include a calcined bauxite abrasives plant and a refractory manufacturing plant. Through 1967 the entire output of bauxite was ship-loaded for export or for delivery to domestic alumina plants. Export contracts call for about 1 million tons annually to Japan and 500,000 tons to West Germany and France. The Queensland Alumina Ltd. plant at Gladstone is committed to take 1.3 million tons per year, and 130,000 tons is to be supplied annually to the Comalco Aluminum (Bell Bay) Ltd. works in Tasmania.

The Queensland Alumina Ltd., 600,000-ton-per-year plant came on stream in 1967. The company later embarked on an enlargement program to raise capacity to 900,000 tons by late 1968.

In Western Australia, Western Aluminium Ltd., a subsidiary of Alcoa of Australia Pty. Ltd., reappraised bauxite reserves at Jarrahdale in the Darling Range at over 500 million tons. Mining and transportation facilities are being expanded and the alumina plant's capacity is being increased from 410,000 to 830,000 tons per year. Completion of these projects is expected in late 1969. Aside from supplying about 80,000 tons per year to the Alcoa of Australia Pty. Ltd. smelter at Port Henry, Victoria, 330,000 tons of alumina is exported annually to the United States and Japan.

A new bauxite discovery in the Kimberley area was being investigated in 1967 by United States Metals Refining Co. and American Metals Climax Inc. Feasibility studies, including an alumina plant and shipping port, were being discussed with the Government of Western Australia.

The expansion of the Comalco smelter at Bell Bay, Tasmania, was completed during 1967 and construction of the Australian Aluminium Co. Ltd. (subsidiary of Alcan of Australia Ltd.) smelter at Kurri Kurri, New South Wales, proceeded throughout the year. By 1969 Australia's aluminum smelters will have a combined ingot capacity of 150,000 tons per year, distributed as follows, in metric tons: Alcan of Australia Ltd. 36,000; Alcoa of Australia Pty. Ltd. 41,000, Comalco 73,000.

Domestic refined aluminum consumption in 1966 totaled about 71,000 tons distributed to the following industry groups: Architectural and building 32 percent, manufacturing and power 30 percent, consumer durables 17 percent, transporation 10 percent, and containers, and agricultural 11 percent.

Copper.—Despite generally favorable market conditions and higher output by

Table 4.—Australia: Major copper industry facilities

Facility	Production (metric tons of copper [1])		
	1964	1965	1966
Mines:			
Mount Isa Mines Ltd	68,334	56,321	65,159
Mount Morgan Ltd	7,542	4,746	7,932
Broken Hill field	3,378	3,222	3,084
Cobar Mines Pty. Ltd	216	1,910	6,048
Mount Lyell Mining and Railway Co. Ltd	13,737	13,968	15,656
Electrolytic Zinc Co. of Australiasia Ltd	1,381	1,444	1,622
Ravensthorpe Copper Mines, N.L	1,011	644	591
Tennant Creek field	9,269	6,743	6,928
Rum Jungle field	819	2,909	2,906
Smelters:			
Mount Isa Mines Ltd	58,223	52,962	64,719
Mount Morgan Ltd	7,534	4,693	6,981
Electrolytic Refining and Smelting Co. of Australia Pty. Ltd	2,271	3,139	6,070
Mount Lyell Mining and Railway Co. Ltd	14,455	13,799	14,169
Refineries:			
Mount Isa Mines Ltd	61,507	44,322	69,285
Electrolytic Refining and Smelting Co. of Australia Pty. Ltd	10,455	6,213	22,118
Mount Lyell Mining and Railway Co. Ltd	11,606	10,383	(2)

[1] Metal content of ore for mines: blister copper for smelters; and electrolytic for refineries.
[2] Since October 1965 all refining has been done by Electrolytic Refining and Smelting Co. of Australia Pty. Ltd.

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most Australian producers, mine production of copper in 1967 was lower than in any year since 1958. Considerably reduced output at Mount Isa Mines Ltd., Australia's largest copper producer, was the major cause of the drop. National blister and refined copper output were similarly affected.

In November 1966, the Minister for Trade and Industry announced that the Copper Bounty Act would not be extended beyond its expiration date of December 31, 1966. No payments have been made under the Act since 1964 when the price was raised to A$680 per long ton. The price has fluctuated in line with London Metal Exchange pricing to a high at A$1,250 on August 5, 1966. At mid-1967 the Australian price was A$950.

Mount Isa Mines Ltd. treated a record 2.84 million metric tons of copper ore in fiscal year 1967; however, its copper content averaged 2.1 percent, compared with about 3.1 percent in each of the previous 5 years. Blister copper output was 52,926 tons, or about 24,000 tons below the 1965–66 year peak. Problems connected with the new K57 shaft complex and difficulties with dilution in mining certain ore bodies were given as responsible for lower grade ores. Return to normal operations is expected by mid-1969. Reserves as of June 30, 1967, included 44.2 million tons of copper ore averaging 3.2 percent copper and 33.1 million tons of lead-zinc-silver ore averaging 7.4 percent lead, 5.6 percent zinc and 5.4 ounces silver per ton.

Mount Morgan Ltd. treated 1.36 million tons of ore that yielded 7,206 tons of blister copper and 103,355 ounces of gold in the year ending July 2, 1967. Ore reserves on that date were estimated at 9.68 million tons averaging 1.08 percent copper.

In 1966, its first full year of operation, Cobar Mines Pty. Ltd. mined 310,000 tons producing concentrates containing 6,048 tons of copper and 147,334 ounces of silver. Reserves in the C.S.A. and Chesney mines total about 27.4 million tons averaging 1.3 percent copper and 6.3 percent zinc.

Mount Lyell Mining and Railway Co. Ltd., in Tasmania, milled 2.17 million tons of ore and produced smelter products containing 14,709 tons of copper, 71,000 ounces of silver, and 8,767 ounces of gold in fiscal 1967. Measured ore reserves were estimated at 16.9 million tons averaging 1.03 percent copper. Recent drilling indicated reserves of 60 to 70 million tons.

Apparent domestic refined primary copper consumption was 85,988 tons in 1966, the highest recorded to date. Copper ore and concentrate exports, all to Japan, totaled about 39,000 tons in fiscal 1967. Blister copper, also all to Japan, amounted to 7,858 tons. Exports of refined and semimanufactured forms totaling 11,721 tons went primarily to New Zealand, and European markets.

Gold.—Following a brief reversal in 1966, the downtrend in gold production continued through 1967 with output less than 700,000 ounces for the first time since 1945. According to 1966 data, about 78.5 percent of the nation's gold was from gold mines, most of which are in the Kalgoorlie district of Western Australia. Byproduct output from copper ores accounted for 17.5 percent, and 4 percent was recovered from lead and zinc ores.

Subsidy payments under the Gold Mining Assistance Act totaled $4,210,000 in 1966, compared with $2,223,000 in 1965. The great bulk of these payments was to 11 large producers in Western Australia; however, a majority of Australia's 179 (in 1966) large and small gold mines received this form of assistance. The hundred or more mines that coproduce gold with copper or other base metals are not eligible for subsidy assistance.

Principal gold mines, all in Western Australia, and their 1966 production were as follows:

Company	Gold produced (troy ounces)
Central Norseman Gold Corp. N.L.	98,992
Gold Mines of Kalgoorlie (Aust.) Ltd.	158,136
Great Boulder Gold Mines Ltd.	83,129
Hill 50 Gold Mine N.L.	41,201
Lakeview and Star Ltd.	148,130
Moonlight Wiluna Gold Mines Ltd.	9,697
North Kalgurli (1912) Ltd.	70,108

Virtually all of the gold produced in the country and crude bullion imported from Papua-New Guinea, Fiji, and New Zealand is refined in Australia. The Royal Mint at Perth, Australia's largest gold refiner, handles all crude bullion from the mines of Western Australia. During 1966 its output totaled 694,669 troy ounces. In 1965, Engelhard Industries Pty. Ltd., Melbourne, refined 72,982 ounces from

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bullion, wastes and alloys.[6] The Broken Hill Associated Smelters Pty. Ltd., Port Pirie, refined precious metals from lead-zinc smelting and Electrolytic Refining and Smelting Co. of Australia Pty. Ltd., Port Kembla, recovered precious metals contained in copper refinery sludges.

Industrial gold consumption was estimated at 96,045 ounces in 1966, compared with 94,611 in 1965 and 77,580 in 1964. Aside from a modest level of foreign trade in gold, as indicated by 1966 crude bullion imports containing 151,462 ounces, and exports of 159,697 ounces in ores and concentrates, the bulk of overseas transactions was sales in premium markets (such as Hong Kong) arranged by the Australian Gold Producers Association Ltd. Such sales in 1966 amounted to 737,217 ounces, at an average net premium of 18 cents per ounce. In 1964 and 1965 quantities were, respectively, 448,310 and 736,432 ounces.

Table 5.—Sources of Australian gold

Material	Troy ounces		
	1964	1965	1966 e
Mines:			
Bullion [1]	811,003	753,033	718,790
Copper ore and concentrate	116,468	90,632	160,540
Lead concentrate	12,395	11,358	10,842
Lead-copper concentrate	19,271	18,732	21,430
Zinc concentrate	4,697	3,888	4,195
Total	963,834	r 877,643	915,797
Refineries:			
Newly won gold [2]	892,726	820,491	788,574
Scrap	19,282	24,449	21,195
Imported, including scrap	141,458	148,434	133,208
Total	1,053,466	993,374	942,977

e Estimate. r Revised.
[1] Includes alluvial and lode production.
[2] Gold content recovered from minerals produced in Australia.

Iron and Steel.—The trend of growth in the Australian iron and steel industry continued through 1966 and 1967. In 1967 the industry was comprised of 10 companies and groups, including the Broken Hill Proprietary Co. Ltd. family of companies that dominates iron and steelmaking in Australia. With the exception of the small state-owned Wood-Distillation, Charcoal-Iron Works at Wundowie, Western Australia, all the rest are relatively new ventures based on the export potential of the rich iron ore deposits in Western Australia, Tasmania, and Northern Territory. Four companies commenced export shipments from Western Australia during 1966 and a fifth, from Northern Territory, in 1967. Tasmania is scheduled to commence exports from Savage River early in 1968 and three companies in Western Australia were developing deposits that are expected to start before 1971.

Iron Ore.—Backed by known reserves of high-grade iron ore that have been conservatively estimated at 16 to 18 billion tons, Australia is destined to assume a leading role among world suppliers. The 19-million-ton 1967 production level is expected to rise to double that figure in 1972 and reach 40 to 65 million tons annually by 1977. With a rather limited domestic market, the great bulk of anticipated production will be exported. Long-term contracts with Japanese steel mills indicate that during the 1970's, about 40 percent of their blast furnace feed will consist of Australian iron ore. Substantial inroads are also expected into the European and possibly U.S. markets. Within the next 10 years Australian economists predict that up to 30 percent of export earnings from minerals will be from iron ore, pellets, and concentrates.

Perhaps the most noteworthy recent development in the iron ore industry was the Commonwealth Government announcement in August 1967 to the effect that

[6] Details not available for later years.

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Table 6.—Status of Australian iron ore production and outlook

(Million metric tons and million dollars)

Organization and mine location	Products	Sales contracts held on November 30, 1967		Production 1966	Ore reserves	
		Value [1]	Tons	Tons	Tons	Fe, percent
Cliffs Western Australian Mining Co. Pty. Ltd.[2]						
Robe River, Western Australia	Pellets, fines	$1,359	140.2	-----	3,000	56
Dampier Mining Co. Ltd. (BHP subsidiary)						
Cockatoo and Koolan Islands, and Koolyanobbing, Western Australia.	Lump	(3)	(3)	2.9	119	62–66
Frances Creek Iron Mining Corp, Pty. Ltd.						
Frances Creek, Northern Territory	----do	32	4.1	-----	5	60–62
Goldsworthy Mining Ltd.						
Mount Goldsworthy, Western Australia.	Lump, fines	177	20.5	1.3	65	54–64
Hamersley Iron Pty. Ltd.						
Mount Tom Price, Western Australia	Lump, pellets, fines.	1,204	134.4	2.0	500	64
Morgan Mining and Industrial Co. Pty. Ltd.						
Mount Bundey, Northern Territory	Lump	12	1.4	-----	1.5	62–65
Mount Newman Consortium						
Mount Whaleback, Western Australia	----do	870	101.6	-----	345	64
Savage River Mines						
Savage River, Tasmania	Pellets	553	45.7	-----	460	45–65
Broken Hill Proprietary Co. Ltd. (BHP)						
Iron Prince and Iron Monarch, South Australia.	Lump, pellets	121	10.7	4.9	136	62–64
Western Mining Corp. Ltd. and Partners						
Koolanooka Hills, Western Australia	Lump	40	5.2	.5	7	60
Contract totals, as of November 30, 1967.	-----	4,368	463.8			

[1] F.o.b. shipping port.
[2] Cliffs Western Australian Mining Pty. Ltd. contracts are currently being renegotiated. Proposal figures are given.
[3] Dampier Mining Co. Ltd. contracts included with Broken Hill Proprietary Co. Ltd.

Source: Pratt, R., Australian Iron Ore Exports—Present and Future. Australian Mineral Industry Quarterly Review. Vol. 20, Nos. 2 and 3, March 1968, Bureau of Mineral Resources, Geology and Geophysics, Canberra, 1968, pp. 39–45.

although approval of contracts would still be required, a more liberal policy regarding price controls would be adopted. The move will permit competition with South American and West African producers in world markets. Companies are now authorized to deal directly for competitive terms.

Existing export contracts, exclusive of the Cliffs Western proposals, call for 74 million tons of exports in the form of pellets. Pelletizing plants are being constructed at Port Latta, Tasmania; Dampier, Western Australia; and Whyalla, South Australia. Two are expected to begin shipments to Japan early in 1968. In Tasmania, concentrates from the Savage River mines will be transported 85 kilometers by pipeline and pelletized and mechanically loaded into ships at Port Latta. Initial shipments are scheduled for April or May 1968. The Hamersley Iron Pty. Ltd. 2-million-ton-per-year pellet plant at Dampier was undergoing preproduction tests in December 1967. Shipments from this plant to Japan are also expected to begin early in 1968. The BHP pellet plant at Whyalla is expected to be commissioned about mid-1968. Besides supplying feed to company blast furnaces, a contract was signed in October 1967 for 10 million tons of Whyalla pellets to Japanese mills over a 10-year period beginning late in 1968.

Pig Iron and Steel.—Details of recent developments in Australia's iron and steel industry are largely found in the annual reports and statements of The Broken Hill Proprietary Co. Ltd. (BHP) whose numerous subsidiaries exercise a near-monopoly in pig iron and steel manufacture. Expanditures on plant modernization and expansion programs have been averaging well over $100 million annually in recent years. A new 50-ton basic oxygen

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furnace and continuous casting facilities were installed and a new merchant mill was being added in the Newcastle works. At Port Kembla a new coke oven battery with byproduct plants and several rolling mill facilities has recently been provided and the No. 5 blast furnace project was well advanced at yearend. A universal beam mill and additional basic oxygen steelmaking facilities have been completed and completion of two coke oven batteries is expected in late 1968. At Kwinana, Western Australia, construction on the first stage of the iron and steel plant complex continued through 1967. First ore shipments from the mines at Koolyanobbing, using the new standard gage rail line, were received in Kwinana in April 1967. The blast furnace and sinter plants are to begin operation in 1968.

According to the company annual report for the year ending March 31, 1967, operations of the BHP group companies were at near capacity levels throughout the year. Shipments to oversea markets totaled over 1 million tons, compared with about 370,000 in the preceding year. Production of iron and steel products by BHP and its subsidiaries (Australian Iron and Steel Pty. Ltd. and Commonwealth Steel Co. Ltd.) was as follows for fiscal years ending May 31:

Commodity	Thousand metric tons	
	1966	1967
Pig iron	4,405	4,655
Steel ingots	5,638	6,144
Blooms and slabs	4,899	5,311
Sheets, bars, billets, etc	2,509	2,563
Plate and strip	1,918	2,217
Merchant	1,408	1,354
Rod	428	501
Narrow cold-rolled strip	60	67
Tinplate	243	261

The Wood-Distillation, Charcoal-Iron Works at Wundowie, Western Australia, reverted to state ownership late in 1966 when Australian National Industries Ltd. withdrew its option to buy the plant. Pig iron production totaled 52,913 metric tons in the fiscal year ending June 30, 1967, compared with 46,262 tons in the 1965–66 year.

Lead and Zinc.—The bulk of Australia's lead and zinc is produced by companies that recover both metals from complex sulfide ores. Mine lead output was slightly above 1965 and 1966 levels but below the 1963 peak, while mine zinc production set a new record. Smelter output of refined lead and lead bullion was also up in 1967 but slab zinc production has remained nearly static for 3 years. Reflecting world market conditions, prices to Australian producers have dropped from averages of A$281.1 and A$286.0 per long ton of lead and zinc, respectively, in 1965 to corresponding figures of A$217.5 and A$260.7 in 1967. By principal company producers, mine output of lead and zinc has been as follows, in metric tons:

Mine	1964		1965		1966	
	Lead	Zinc	Lead	Zinc	Lead	Zinc
North Broken Hill Ltd	70,634	57,375	68,989	54,581	65,117	52,151
Broken Hill South Ltd	36,053	30,502	31,235	29,385	28,165	29,569
The Zinc Corp. Ltd	101,594	76,801	105,889	84,345	103,030	84,062
New Broken Hill Consolidated Ltd	92,097	95,038	94,116	106,418	90,428	113,423
Mount Isa Mines Ltd	62,920	38,180	50,470	31,466	66,577	44,288
Electrolytic Zinc Co. of Australiasia Ltd	15,180	50,955	14,646	47,053	15,828	50,651

In 1966 (1965 figures in parentheses) the Imperial Smelting process plant of the Sulphide Corp. Pty. Ltd. at Cockle Creek, New South Wales, produced 21,689 (22,587) tons of lead bullion and 52,351 (56,161) tons of zinc metal. The Mount Isa Mines Ltd. smelter in Queensland recovered 56,170 (47,777) tons of lead in bullion and copper-lead dross. The Broken Hill Associated Smelters Pty. Ltd. at Port Pirie, New South Wales, produced 196,228 (196,409) tons of refined primary lead. And the Electrolytic Zinc Co. of Australasia Ltd. at Risdon, Tasmania, produced 145,179 (146,021) tons of refined zinc.

Further investigation of the lead-zinc ore

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body at McArthur River in northern Queensland by subsidiaries of Mount Isa Mines Ltd. revealed ore reserves of around 200 million tons averaging 4 percent lead and 9 percent zinc. Because of the extremely fine-grained intermixture of metallic minerals in the ore, metallurgy is considered a problem. The company has spent more than $3 million on feasibility studies and research and is confronted with possible expenditures of over $200 million to bring the project into production.

A 35,000-ton-per-year increase in refined zinc capacity is scheduled to become available early in 1968 with completion of the new refluxing plant at the Sulphide Corp. Pty. Ltd. Cockle Creek smelter.

Domestic refined lead consumption in 1966 totaled 63,400 tons, of which about 38 percent was from secondary sources. Zinc consumption, all primary, totaled 90,100 tons.

Manganese Ore.—Australian manganese ore production increased sharply after the Government eased export controls in January 1966. Prompt reaction by producers in Western Australia resulted in contracts involving 150,000 tons for delivery during 1967–68 to Japan from the several mines[7] dominated by Bell Brothers Pty. Ltd. First shipments from The Broken Hill Proprietary Company Ltd. operations on Groote Eylandt in the Gulf of Carpenteria to the Tasmanian Electro Metallurgical Co. Pty. Ltd. at Bell Bay, Tasmania, were made in July 1966. During the first 9 months of 1967 Australia's manganese ore output exceeded 400,000 tons of which 200,000 tons were exported to Japan and 28,300 tons to other countries.

The Tasmanian Electro Metallurgical Co. doubled its annual high-carbon ferromanganese productive capacity during 1966 to 75,000 tons. The new capacity provided a surplus of 11,000 tons that was exported to the United States in October 1966.

Apparent Australian consumption of metallurgical grade manganese ore amounted to about 140,000 tons in 1966, compared with 95,000 tons in 1965. Before the Groote Eylandt source became available a large part of the domestic requirement was supplied by imports of 50,000 to 60,000 tons annually. In 1966 manganese ore imports fell to 12,500 tons, and for 1967 the quantity is expected to drop below 7,000 tons.

Nickel.—Australia's nickel potential was considered insignificant until 1966 when Western Mining Corporation Ltd. announced its decision to exploit the newly discovered nickel sulfide deposits at Kambalda, and South Western Mining Ltd. reported vast indicated reserves of lateritic nickel ores in the Blackstone Range, both in Western Australia. In a dynamic construction and mine development program Western Mining Corporation started mill operation in mid-1967 and by yearend reported treating 62,000 tons of ore that yielded 15,000 tons of concentrates containing 13.03 percent nickel and 1.66 percent copper. Proven ore reserves in company holdings have been given as 9.3 million tons averaging 3.8 percent nickel. Initial shipments have gone to the Sherritt Gordon Mines Ltd. refinery in Canada, but contracts with Sumitomo Metal Mining Co. Ltd. called for shipments (40,000 tons contained nickel, over 10 years) to Japan to commence in September 1967. An agreement with the Western Australia Government provides for erection of a 15,000-ton-per-year nickel refinery at Kwinana near Perth, Western Australia by 1971.

South Western Mining Ltd. (owned 73 percent by International Nickel Co. of Canada, 27 percent by Nickel Mines of Australia, N.L.) continued investigation of the lateritic nickel deposits at Wingellina, in the Blackstone Range throughout 1967. Reserves were estimated in February at 60 million tons containing 1.32 percent nickel.

The recent successful developments in Western Australia have stimulated search activities that have assumed rush proportions in the Kalgoorlie-Kambalda vicinity and extended to other areas of Western Australia and further afield. During the past 2 years over 100 leases have been granted by the Western Australia Government to individuals and domestic and foreign companies. Several of the leases have included drilling, with encouraging results.

In Northern Queensland, Metals Exploration N.L. and Freeport of Australia Inc. have drill-defined a shallow deposit containing 45 million tons of lateritic ore

[7] Westralian Ores Pty. Ltd. (subsidiary of Bell Bros. Pty. Ltd.) operates mines at Woodie Woodie and Skull Springs in the Pilbara Goldfield and at Horsehoe in the Peak Hill Goldfield. Shipping ports are Geraldton and Port Hedland.

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averaging 1.55 percent nickel and 0.11 percent cobalt at Greenvale (about 160 kilometers northwest of Townsville).

Domestic nickel consumption, virtually all of which has been supplied by imports, totaled 2,900 tons in 1966, an increase of about 12 percent above the 1964–65 level. While the bulk of Australian usage traditionally has been by the steel and plating industries, a 2-year contract with Sherrit Gordon Mines Ltd. provides for return to the Australian Mint of 700 tons of refined Western Mining Corp. metal for use in Australian coins.

Silver.—Reflecting somewhat higher production of base metal ore from which the great bulk of Australian silver is produced, output was at a record level in 1967. From a relatively stable price of about A$1.17 per ounce maintained through 1966 and into May 1967, by December 1, 1967, Australian silver was priced at A$1.80 per ounce. Following the example of many other countries, Australia discontinued use of silver in newly minted coins, and purchases by the Treasury were suspended late in 1966. As a result, refined silver exports in the first 9 months of 1967 totaled 3.4 million ounces compared with 234,000 ounces in 1966.

Silver production by source materials in recent years was as follows:

Source material	Thousand troy ounces			
	1963	1964	1965	1966
Mines:				
Copper ore and concentrate	910	914	825	1,140
Lead ore and concentrate	16,835	15,485	14,464	15,259
Lead-copper concentrate	942	1,048	1,085	1,108
Zinc concentrate	731	725	697	1,122
Gold bullion, etc	224	255	260	246
Refineries:				
Smelter products	8,659	9,019	8,419	277
Mint, doré bullion	228	239	8,714	212

The great bulk of Australia's mine production in 1966 and 1967 was by the following companies:

Company	Thousand troy ounces	
	1966	1967
Mount Isa Mines Ltd	6,122	4,582
North Broken Hill Ltd	3,658	3,827
Broken Hill South Ltd	1,615	1,631
Zinc Corp. Ltd	2,485	2,515
New Broken Hill Consolidated Ltd	2,338	2,503
Reed-Roseberry Mine	1,764	1,621

Tin.—Mine production of tin was at a record level and exploration and development activities continued throughout 1967. With achievement of full capacity from the two new 1,000-ton-per-day mills at Rension Bell and Mount Cleveland, Tasmania, and added production from new mines in North Queensland and New South Wales, the outlook for further increased production was bright.

Consolidation of Australia's tin smelting facilities in mid-1966 involved the joining of O. T. Lempriere and Co. Ltd. and Sydney Smelting Co. Ltd. with Australian Iron and Steel Pty. Ltd. in establishing Associated Tin Smelters Pty. Ltd. The new company modernized and expanded the O. T. Lempriere works at Alexandria near Sydney, New South Wales, and early in 1967 commissioned facilities, described as adequate to smelt all of Australia's increasing tin concentrates production.

The tin industry included 363 tin mining operations employing 1,550 workers in 1966. Approximately 35 percent of 1966 tin-in-concentrate output was from Queensland, 28 percent New South Wales, and 22 percent from Tasmania. Principal companies and quantities of contained tin produced in 1965 and 1966 were as follows:

	Long tons	
	1965	1966
Aberfoyle Tin N.L	436	403
Ardlethan Tin N.L	590	621
Austral Malay Tin Ltd	93	188
Cooglegong Tin Pty. Ltd	144	e 149
J.A. Johnson & Sons Pty. Ltd	83	e 104
Pilbara Tin Pty. Ltd	95	e 224
Ravenshoe Tin Dredging N.L	187	541
Renison Ltd	334	385
Tableland Tin Dredging N.L	635	e 470
Tullabong Tin Syndicate	307	275

e Estimate.

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Domestic primary tin consumption was 4,285 long tons in 1966, including 2,600 tons used in tinplate production, 1,008 tons in solder and the balance for tinning, alloys, and other uses. The great bulk of exported Australian tin, totaling 1,272 tons in 1966, has been in concentrates, largely to United Kingdom.

Titanium.—Australia's beach sand mining industry continued to expand throughout 1966–67 and established successive production records for each of the principal concentrate products, ilmenite, rutile, and zircon, in both years. Developments included additions to existing facilities, several new producers, and successful offshore ventures into high-dune areas on east coast islands. A survey[8] of Australia's beach sands resources published early in 1968 estimated potential reserves at 6.55 million tons of rutile, 6.76 million tons of zircon, and 16.26 million tons of ilmenite.

During 1966 new separation plants were commissioned on the New South Wales coast, adding 28,000 metric tons annual rutile capacity by Associated Minerals Consolidated Ltd. at Hexham and 15,000 tons by Mineral Deposits Pty. Ltd. at Hawkes Nest. Titanium and Zirconium Industries Pty. Ltd. and Consolidated Rutile Ltd. both commenced high-dune operations on North Stadbroke Island, Queensland, in 1966. In November 1967 Queensland Titanium Mines Pty. Ltd. commissioned a new operation, including a plant designed for 20,000 tons each of rutile and zircon annually, at Inskip Point, 260 kilometers north of Brisbane.

On the west coast, expansion programs undertaken by Western Titanium N.L. and Westralian Oil Ltd. are expected to significantly increase ilmenite concentrate production by 1969. The beneficiation plant of Western Titanium N.L., with annual capacity for 10,000 tons of high-grade TiO_2, was recently commissioned.

Domestic rutile consumption, mainly in coating welding rods, was estimated at about 2,700 tons in 1966. Ilmenite consumption, all by pigment producers, amounted to about 66,000 tons, and zircon usage, largely in foundry applications, was estimated at 4,300 tons during the same year.

NONMETALS

Asbestos.—Following 23 years of operation and output above the level of recent years in 1966, closure of the Australian Blue Asbestos Pty. Ltd. mine at Wittenoom, Western Australia, in December 1966 reduced Australia's asbestos production to insignificance. Three small mines, one in New South Wales and two in Western Australia, accounted for 534 tons of chrysotile fiber; no blue asbestos (crocidolite) was produced during 1967.

Closure of the Wittenoom mine has been attributed to rising costs and low prices that resulted in losses at an annual rate of A$850,000. The property and assets were reportedly sold by the parent Colonial Sugar Refining Co. Ltd. to L. Hancock and E. Wright, holders of interests in Hamersley Iron Mines. The new owners are considering reopening the asbestos operation on a larger scale in conjunction with exploitation of iron ore deposits in the vicinity.

Phosphate Rock.—Although output of phosphate rock in South Australia was up substantially in 1967, domestic production remained insignificant in the national supply. Imports, during 1967, totaling over 3.3 million tons, were mostly (74 percent) from Nauru and Ocean Islands in the Pacific and Christmas Island in the Indian Ocean.

Rewarding an intensive, Government-sponsored search for an Australian source, several important discoveries, all in Queensland have recently been announced. Early in 1966, Broken Hill South Ltd. announced discovery of deposits subsequently proved to contain hundreds of millions of tons of rock phosphate grading 20 to 22 percent P_2O_5 in shallow beds 30 to 60 feet thick near Duchess. Later, the company reported a second discovery in the Lady Annie area, about 240 kilometers north of Duchess, estimated at 80 million tons of about 20-percent grade in a shallow bed 20 feet thick. U.S. International Minerals & Chemical Corp. announced discovery of about 500 million tons averaging 16 percent P_2O_5, with a bed thickness of about 15 feet at Yelverstoft, approximately 95 kilometers northeast of Mount Isa.

Each of these discoveries is in a remote and extremely arid region. Major feasibility considerations have involved upgrad-

[8] Kenneth McMahon and Partners Pty. Ltd. (Sydney, New South Wales, mining consultant). Article titled "$50m A Year from Major Rutile Expansion . . . " The Australian Financial Review, Sydney, Feb. 15, 1968.

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ing the natural material, which normally requires a generous supply of water, and transporting the product to distribution centers.

Superphosphate manufacturers reported record production of 4,498,800 tons during 1967. However, sales for the year were 6 percent below those of 1966.

Salt.—In 1966, Australia's salt industry consisted of 34 producers employing 275 persons. All but six operations were in South Australia and Victoria. Nearly two-thirds of the year's total was produced in South Australia by Imperial Chemical Industries of Australia and New Zealand Ltd. (I.C.A.N.Z.) at Dry Creek (361,089 tons), and The Broken Hill Pty. Co. Ltd. at Whyalla (52,800 tons).

Recent developments in Western Australia and Queensland indicate a vast increase in production and exports of salt within the next few years. After initial technical difficulties were solved, Shark Bay Salt Pty. Ltd. at Shark Bay, Western Australia, in July 1967, commenced shipments to Japan under a 7-year contract to supply 1.6 million tons. Shark Bay Salt expects to produce 500,000 tons annually within 2 years and eventually to sell 1.5 million tons per year. At Port Hedland in Western Australia, the Leslie Salt Co. (of San Francisco) solar plant is scheduled to start shipments at 480,000 tons per year in 1969.

Exmouth Salt Pty. Ltd. plans to construct facilities with an annual capacity of 1.5 million tons, with exports beginning in 1970, on the east coast of Exmouth Gulf, 48 kilometers from the tip of North West Cape. At Dampier, Comalco Industries Pty. Ltd. with Japanese partners, are planning solar salt harvest at an initial annual rate of 350,000 tons by 1971. Other salt production prospects in Western Australia included Texada Mines Ltd. (of Canada) with an interest in coproducing salt and potash from Lake McLeod, and Norseman Gold Mines N.L. which plans to harvest salt from Lake Lefroy.

In addition to its large works in South Australia, I.C.A.N.Z. is developing a new field at Port Alma, Queensland, primarily to supply its chlorine-caustic soda plant near Sydney. Salt production is to begin about August 1968.

Apparent domestic consumption of salt was estimated at 556,300 tons in 1965 and 567,000 tons in 1966. Exports, the great bulk of which go to Japan, have been averaging about 100,000 tons per year.

Sulfur.—Sulfur is one of the few mineral raw materials in short supply in Australia. There are no known commercial deposits of native sulfur and the natural gas discovered in several widely scattered localities is all of extremely low sulfur content. Australian requirements are met by recovery of sulfur from indigenous pyrite and base metal sulfide ores and imports of elemental sulfur from Canada, United States, Mexico, and other countries. Imports of elemental sulfur in 1967 amounted to 522,021 tons, an increase of 18 percent above the 1966 level.

Pyrite is mined and concentrated for sulfur at Nairne, South Australia, and at several gold mines in the vicinity of Kalgoorlie, Western Australia. Base metal smelters at Port Pirie, South Australia, Cockle Creek, New South Wales, and Risdon, Tasmania recover sulfur from sinter gases. Elemental sulfur is recovered from petroleum by Petroleum Refineries (Australia) Pty. Ltd. at Altona, Victoria, and Port Stanvac, South Australia, and by Shell Refining (Australia) Pty. Ltd. at Clyde, New South Wales.

Approximately 75 percent of the sulfur consumed in Australia goes into sulfuric acid. Papermaking, manufacture of insecticides and fungicides, and the rubber industry account for the remainder.

To meet the growing industrial demand, output of sulfuric acid has increased steadily in recent years to a record 2,012,000 metric tons in 1967. Of total 1966 acid production (1,907,755 tons) about 64 percent was made from imported elemental sulfur, 15 percent from pyrite, 20 percent from zinc and lead sulfide ores, and 1 percent from other materials.

MINERAL FUELS

Black Coal.[9]—The uptrend in production of black coal continued through 1966 and 1967 with successive records established for both years. Exports, dominated by quantities to Japan, also were at record levels, totaling 8.46 million tons in 1966 and 9.38 million tons in 1967. Production from coal mines in New South Wales in-

[9] Includes bituminous, semianthracite, and subbituminous varieties.

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creased 5 percent to 27.22 million tons in 1967; and Queensland production rose about 2 percent to 4.85 million tons.

In 1966, 145 underground mines with 14,809 employees and 13 opencut mines employing 1,005 were active. Approximately 15.8 percent of total 1966 black coal production was from opencut mines. As reported by the Joint Coal Board,[10] productivity in leading producer States was as follows:

Table 7.—Black coal production per man-shift

(In metric tons, on the basis of all employees)

State	Underground mines			Opencut mines		
	1964	1965	1966	1964	1965	1966
New South Wales	7.7	8.5	8.8	21.8	20.8	21.4
Queensland	4.7	5.5	6.0	16.6	17.6	18.3
South Australia	---	---	---	24.3	27.5	28.8
Western Australia	4.5	4.3	4.4	12.7	11.4	12.0
National total	6.9	7.8	8.2	19.7	20.2	20.7

On the basis of existing and projected export contracts, Australia's[11] annual coal shipments to Japan are expected to rise by 1975 to 20 million tons, with Queensland fields supplying about 12 million tons. A contract recently renegotiated by Thiess-Peabody-Mitsui Coal Pty. Ltd. calls for 4.5 million tons annually from the Moura coalfield, beginning in 1968. Connecting railway and port facilities at Gladstone will be ready early in the year. Preparation of Utah Development Co.'s opencut mine at Blackwater commenced in 1966. Including a 1967 revision, existing contracts from the Utah project call for 21.5 million tons over 10 years beginning in 1968. Clutha Development Co. has confirmed reserves of over 400 million tons in its Sirius Creek leases in the Blackwater field. Shipments from these deposits are expected to start in 1969 or 1970 at 2 million tons annually. In November 1967 the Clutha Company also contracted with Japanese companies to supply 3 million tons annually, for 6 years beginning in 1971, from leases at Burragorand, New South Wales.

Black coal consumption in recent years was distributed as follows by industry:

Industry	Thousand metric tons		
	1964–65	1965–66	1966–67
Iron and steel	5,984	6,210	6,782
Electricity	9,387	10,570	10,979
Railways	r 1,308	1,036	777
Town gas	1,375	1,270	1,148
Cement	999	943	865
Metallurgical coke	416	450	440
Ships bunkers	112	89	62
Other	r 2,444	2,285	2,093
Total	r 22,025	22,853	23,146

r Revised.

Brown Coal.—Australia's entire brown coal output was from opencut mines in southern Victoria. Over 95 percent of the total was mined and used in mine-mouth powerplants of the State Electricity Commission (S.E.C.) at Morewell and Yallourn in the Latrobe Valley. The Commission reported production of 21.4 million tons of brown coal in fiscal year ending June 30, 1966. Also announced was the purchase of a new bucket wheel dredge of 1,600 cubic yards per hour capacity that will be put in service by 1970.

Brown coal briquet manufacture by the S.E.C. Yallourn and Morewell briquet works in 1965–66 were, respectively, 509,560 and 1,403,500 tons. Consumption of brown coal for briquet manufacture totaled 5.8 million tons. Distribution of briquets was 36 percent to the electric power plants, 55 percent was sold for general industrial and domestic fuel uses, and 9 percent for gas generation.

Petroleum and Natural Gas.— Although Australia continued to rely heavily on foreign sources for petroleum, indigenous sources by yearend 1967 supplied about 9 percent of national requirements. With increases virtually assured from the Moonie and Alton fields in Queensland, the Barrow Island field off the coast of Western Australia and expected yields from proved oilfields in Bass Strait, off Victoria, the proportion is due to approximate 60 percent by 1971. Upon completion in 1969 of pipelines presently being constructed,

[10] Joint Coal Board. Twentieth Annual Report 1966–67. Sydney, Australia, 1967.

[11] Esso Exploration and Production Australia Inc. and Hematite Petroleum Pty. Ltd. (subsidiary of The Broken Hill Proprietary Ltd.).

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the city of Melbourne will be supplied with natural gas, piped 175 kilometers from the Marlin and Barracouta fields in Bass Strait. Adelaide will be served by a 770-kilometer line from the Moomba and Gidgealpa fields in northeast South Australia, and a 450-kilometer pipeline will carry gas from Roma to Brisbane in Queensland. Thus by 1970, three of Australia's largest cities will be supplied by natural gas that has been discovered and brought into commercial service within a 4-year period.

Exploration and development activities by private companies, the Bureau of Mineral Resources, and State Geological agencies continued at a high level throughout 1966 and 1967. Significant features of these activities have been the growing attention to offshore areas as reflected in important new discoveries, relatively high success ratio, and the passage of legislation resolving conflicts between individual States and the Commonwealth Government regarding offshore rights. Expenditures on petroleum exploration during 1966 totaled $82.2 million, of which private enterprise contributed $65.9 million and Commonwealth and State Governments, $16.3 million. Payments under the Petroleum Search Subsidy Act 1959–64, amounted to $11.4 million in 1966 and $11.5 million in 1967. About 200 concessions, held by over 100 companies and groups, were in force during the late months of 1967. Offshore concessions, totaling around 2.3 million square kilometers, extended along four-fifths of the continental coast. Numerous geophysical survey teams and six offshore drilling rigs were employed during 1967. A record number of 274 wells were drilled during the year and footage drilled in 1967 totaled 1,079,756, compared with 755,822 in 1966 and 1,153,189 in 1965. Of the 87 exploratory wells drilled during 1967, discoveries were recorded in nine, indicating a success ratio of 1:9.7. Exploration and development highlights during 1966 and 1967 included the Esso-BHP discovery of the Marlin gas-oil field 45 kilometers off Gippsland, Victoria;[12] the Delhi-Santos discovery of Moomba gasfields near Gidgeapla, South Australia[13]; Wapet's confirmation of its Barrow Island oilfield, in Western Australia, as commercial in 1966 (and initiation of shipments from there in May 1967);[13] the Esso-BHP discovery of the Kingfish oilfield, 80 kilometers off Paynesville, Victoria; and Esso-BHP discovery of the Halibut oilfield, 67 kilometers off Bairnsdale, Victoria.

The year's development doubled the proved and probable oil reserves in Australia, from an estimated 300 million barrels at yearend 1966, to 600 million barrels at yearend 1967. Corresponding estimates for gas reserves have been raised from 4,500 million cubic feet in 1966 to 8,000 million at yearend 1967.

Australian consumption of petroleum was at a rate of 420,000 barrels per day in 1967, about 9.1 percent higher than that of the previous year.[14] The processing industry consisted of 11 refineries with a total daily capacity of 542,300 barrels and 25 petrochemical plants. About 95 percent of the petroleum product demand was met by local refineries. Products consumed in 1966–67 totaled 143 million barrels, distributed 36 percent to gasoline, 25 percent to heavy fuel oils, including bunkers, 10 percent to diesel distillate, and the balance to other products.

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[12] Delhi Australian Petroleum Ltd. and Santos Ltd.
[13] West Australian Petroleum Pty. Ltd.
[14] Mona Palmer Publishing Co. Inc. World Petroleum Report. 1968. New York, 1968, pp. 22–25.

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The Mineral Industry of Austria

By Justin B. Gowen [1]

A preliminary estimate of Austria's output of marketable ores and minerals derived from domestic resources in 1967 had an indicated value of about $232 million, representing a decrease of about 4 percent from 1966 and 8 percent from the post World War II high output of 1965. This value was equivalent to 2.3 percent of the country's gross national product provisionally estimated at $10,020 million in 1967, at current prices.

The value of crude mineral production in million dollars by major commodity groups was as follows:

Commodity group	1963	1964	1965	1966	1967 e
Petroleum and natural gas [1]	$80.3	$83.4	$87.6	$85.6	$83.0
Stone and industrial minerals	56.4	69.1	82.0	76.4	72.0
Coal	45.6	44.4	40.1	37.5	34.0
Metallic ores	34.8	35.2	35.0	35.3	36.0
Salt and brine	7.2	7.0	7.6	7.6	7.0
Total	224.3	239.1	252.3	242.4	232.0

e Estimate.
[1] Includes oil shale.

Employment in the mineral based industries at the end of July 1967 numbered about 550,000 persons as follows: mining 27,000; nonmetals 54,000; metals 377,000; chemicals 63,000; energy 28,000.

PRODUCTION

The output of metallic ores showed only small changes in 1967 from levels of 1966, while output of a number of industrial minerals, coal and crude oil, declined. Metal output at nonferrous smelters was generally slightly higher than in 1966 but steel industry production was lower at all stages of processing (pig iron, ingots, and semimanufactures). Petroleum refinery output, based to a significant extent (about 40 percent) on imported crude oil, moved ahead of the 1966 level.

[1] Physical scientist, Division of International Activities.

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Table 1.—Austria: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Aluminum:					
Bauxite	17,830	3,708			
Alumina	12,000	14,850	17,993	22,088	24,000
Metal and alloys:					
Primary, unwrought	76,464	77,697	78,735	78,927	78,745
Secondary and remelted, unwrought	34,736	39,241	31,072	22,224	24,109
Semimanufactures	30,723	31,983	32,281	33,898	36,828
Antimony:					
Ore:					
Gross weight (wet)	17,550	18,430	17,723	19,453	19,789
Antimony content	867	893	692	660	NA
Concentrates:					
Gross weight	750	798	653	386	NA
Recoverable content	497	531	394	227	NA
Crudum (antimony sulfide)	r 431	411	380	551	665
Cadmium kilograms	18,800	19,400	21,000	r 21,200	19,000
Copper:					
Ore:					
Gross weight (wet)	138,093	114,471	121,201	143,563	144,691
Copper content	1,933	1,613	1,576	1,902	1,906
Concentrate:					
Gross weight	7,228	5,716	5,589	6,730	NA
Copper content	1,885	1,565	1,522	1,853	NA
Copper sulfate	618	594	980	702	NA
Metal:					
Electrolytic	13,050	14,642	16,206	17,025	17,444
Other refined (including secondary)	2,832	2,882	1,986	1,036	823
Semimanufactures, copper and alloys	37,480	42,482	37,717	36,054	32,804
Germanium concentrates; [1] germanium content kilograms	NA	NA	NA	7,500	8,850
Iron and steel:					
Iron ore:					
Gross weight thousand tons	3,734	3,563	3,536	3,475	3,473
Iron content do	1,180	1,128	1,110	r 1,099	1,098
Pig iron do	2,106	2,204	2,200	2,195	2,140
Ferroalloys do	4	5	4	5	5
Crude steel:					
Linz-Donawitz do	1,849	1,964	1,969	1,958	NA
Open hearth do	747	823	840	837	NA
Electric do	351	407	412	398	NA
Total do	2,947	3,194	3,221	3,193	3,023
Semimanufactures, except pipe and wire:					
Wire rod do	220	236	259	255	268
Other bars and rods do	296	403	445	469	391
Shapes, excluding rails do	42	48	56	73	48
Heavy plates, including universal plates thousand tons	303	312	298	284	1,272
Medium plates and sheets do	58	79	65	72	
Fine plates and sheets do	497	520	429	426	
Sheet coils, medium and fine do	409	425	486	543	
Hot strip do	153	194	177	168	161
Rails and railway track material do	54	59	69	56	53
Total do	2,032	2,276	2,284	2,346	2,193
Semimanufactures for further processing elsewhere thousand tons	28	29	29	29	33
Lead:					
Lead and zinc ores:					
Gross weight, wet	187,907	197,358	196,964	190,296	196,015
Lead content	5,529	5,924	5,891	5,685	NA
Lead concentrates:					
Gross weight	6,972	7,178	6,916	6,671	6,593
Lead content, recoverable	4,993	5,195	5,038	4,841	4,804
Metal and alloys:					
Primary, unwrought	6,426	8,496	7,694	7,173	7,789
Secondary, unwrought	3,356	4,810	5,292	4,689	5,365
Total	9,782	13,306	12,986	11,862	13,154
Semimanufactures	3,634	4,064	3,961	4,043	3,248
Manganese content of iron ores	71,600	68,786	67,456	69,500	NA
Nickel sulfate	209	225	173	202	NA
Silver troy ounces	68,803	73,947	76,519	93,237	NA

See footnotes at end of table.

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Table 1:—Austria: Production of mineral commodities—Continued

(Metric tons unless otherwise stated)

Commodity	1963	1964	1965	1966	1967 p
Metals—Continued					
Tungsten:					
Ores:					
Gross weight, wet	7,222	5,269	5,682	6,342	9,061
WO_3 content	142	81	150	82	144
Concentrates 60 percent WO_3 basis	223	105	195	137	240
Zinc:[2]					
Zinc content of ores	9,170	9,763	9,547	10,483	NA
Concentrates:					
Gross weight	14,436	14,691	14,000	15,677	16,503
Zinc content, recoverable	7,091	7,261	6,903	7,773	8,121
Metal:					
Electrolytic, unwrought	11,861	12,896	13,113	14,201	14,157
Fire refined, unwrought	574	676	1,156	1,231	1,228
Total	12,435	13,572	14,269	15,432	15,385
Semimanufacturers, including alloyed	1,589	1,525	1,778	1,627	1,464
Nonmetals:					
Asbestos	579				
Barite	2,173	1,261	2,334	r 2,800	2,456
Cement—thousand tons	3,312	3,769	4,044	4,501	4,548
Clays and clay products:					
China clay (kaolin)—do	349	368	328	378	384
Bentonite—do	3	3	4	2	1
Illite—do	66	71	68	143	136
Other—do	49	48	51	69	47
Clay products:					
Refractory brick—do	59	71	75	71	63
Building bricks—million pieces	1,006	1,095	1,064	1,091	1,044
Roofing tile—do	45	r 41	33	24	22
Diatomite	3,936	3,832	4,034	3,754	3,657
Feldspar	2,110	1,629	1,419	1,531	2,480
Graphite:					
Crude	99,589	102,237	85,755	79,539	32,541
Marketable:					
For direct consumption in blast furnaces	76,487	77,059	57,052	e 49,500	NA
Foundry grade	21,525	22,457	24,346	19,898	19,530
Electrode grade	810	520	332	550	772
Flotation graphite mainly for fine grinding	256	518	857	923	768
Gypsum and anhydrite—thousand tons	585	568	618	777	738
Lime:					
For construction—do	575	608	584	580	560
For agriculture—do	113	122	108	114	133
Magnesite:					
Crude—do	1,313	1,657	1,816	1,615	1,535
Sintered or dead burned—do	411	522	566	491	450
Caustic calcined—do	170	192	198	199	176
Magnesite and chrome magnesite refractories—thousand tons	223	277	282	269	238
Pigments, (specular hematite)	4,120	4,304	5,283	4,780	5,268
Pumice	21,182	22,882	20,426	21,081	22,634
Quartz and quartzite	65,859	68,897	76,922	60,660	50,393
Quartz sand—thousand tons	199	197	307	294	204
Salt:					
Rock—do	5	1	1	1	1
Evaported—do	166	167	186	185	191
In brine—do	e r 209	224	r 217	r 284	233
Sand and gravel—do	NA	NA	NA	4,750	4,474
Sand, industrial n.e.s—do	47	56	67	69	60
Stone:					
Building—do	NA	NA	NA	47	e 49
Crushed—do	6,274	7,036	r 6,834	r 7,112	7,398
Sulfur, all forms	NA	29,500	30,200	29,275	31,550
Talc and soapstone	65,644	71,872	75,902	76,303	77,733
Mineral fuels:					
Coal:					
Bituminous—thousand tons	104	103	59	20	14
Lignite and subbituminous—do	6,053	5,761	5,450	5,283	4,604
Total—do	6,157	5,864	5,509	5,303	4,618

See footnotes at end of table.

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Table 1.—Austria: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Mineral fuels—Continued					
Coke:					
From coke ovens thousand tons	1,634	1,608	1,548	1,474	1,407
From gasworks do	343	313	286	223	213
Total do	1,977	1,921	1,834	1,697	1,620
Gas:					
Natural:					
Wet million cubic feet [3]	r 12,375	r 14,058	r 14,951	18,527	NA
Dry do	r 47,623	r 48,231	r 45,921	r 47,636	NA
Total do	r 59,998	r 62,289	r 60,872	r 66,163	60,336
Oil shale	325	45	580	320	598
Peat e thousand tons	5	5	5	2	2
Shale oil	11	2	11	5	12
Shale oil products	90	71	84	54	NA
Petroleum:					
Crude thousand tons	2,620	2,663	2,855	2,757	2,685
Refinery products:					
Liquid petroleum gases do	39	67	81	77	85
Gasoline do	374	514	644	701	838
Kerosine do	58	69	51	r 93	78
Gas oil do	845	859	851	861	895
Fuel oil do	1,392	1,591	1,798	r 1,849	2,028
Lubricants do	111	192	185	r 206	184
Asphalt and bitumen do	126	159	187	r 215	244
Other do	3	4	5	4	-------
Total do	2,948	3,455	3,797	4,006	4,352

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Byproduct of zinc refining.
[2] Zinc ores included in "Lead and zinc ores" shown under "Lead."
[3] Converted from cubic meters at 0° C. and 760 millimeters Hg to cubic feet using a conversion factor of 35.3145 cubic feet per cubic meter.

TRADE

The value of Austria's mineral commodity trade, both exports and imports, increased in 1966, the most recent year for which complete data are available, but the rate of increase was not as great as that for total commodity exports and imports. Thus mineral commodities accounted for a slightly lesser share of total commodity trade than in 1965 as shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	[1] 338.9	1,600.0	21.2
1966	350.4	1,683.6	20.8
Imports:			
1965	407.4	2,100.6	19.4
1966	449.3	2,327.6	19.3
Trade balance:			
1965	[1] −68.5	−500.6	XX
1966	−98.9	−644.0	XX

XX Not applicable.
[1] Data differs from that presented in 1965 Minerals Yearbook chapter because of the exclusion of the value of electric power exports in this tabulation.

A $9.7 million increase in nonferrous metal exports and a $5.2 million increase in iron and steel exports served not only to compensate for modest declines in exports of metal ores, scrap metal, nonmetallic minerals, and mineral fuels but also was sufficient to increase the total value of mineral commodity exports by $11.5 million over the 1965 level. Iron and steel exports valued at $220.5 million in 1966 accounted for 63 percent of mineral commodity exports by value, while nonferrous metal shipments at $59.9 million and nonmetallic mineral manufactures at $32.8 million accounted for 17 and 9 percent, respectively, of mineral commodity exports.

The higher value of total mineral commodity imports in 1966 was principally the result of greater receipts of petroleum (an increase of $15.7 million), steel (an increase of $11.3 million), and nonferrous metals (an increase of $7.5 million), although the value of imports of all major mineral commodity groups increased except solid fuels (a decrease of $6.6 mil-

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lion). Despite the decline, however, this group (coal, coke and briquets) remained the foremost mineral commodity import group, accounting for almost 19 percent of the total, followed by iron and steel (18 percent), petroleum (17 percent), and nonferrous metals (14 percent).

Countries of the European Economic Community received 44 percent of Austria's 1966 mineral exports on a value basis and provided 47 percent of the nation's imports of those commodities; Communist Europe received 24 percent of mineral exports and provided 26 percent of the country's mineral imports. The United States was only a minor trading partner in minerals receiving 2.7 percent of total mineral exports on a value basis and providing only 3.3 percent of mineral imports.

Table 2.—Austria: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Aluminum oxide and hydroxide	14,986	17,557	Poland 5,387; West Germany 2,453; United States 2,293.
Metal and alloys:			
Scrap	4,439	5,452	Italy 3,176; West Germany 2,275.
Ingots and equivalent forms	31,971	37,084	West Germany 21,571; Switzerland 4,340.
Semimanufactures	17,831	22,984	West Germany 4,851; United Kingdom 2,166; United States 2,142.
Antimony:			
Ore and concentrate	742	389	Belgium-Luxembourg 298.
Sulfide	r 6	12	West Germany 4; Pakistan 4.
Cadmium metal, all forms. kilograms	15,000	4,600	Czechoslovakia 4,000; West Germany 600.
Chromite	854	494	West Germany 472.
Copper and alloys:			
Unwrought, including scrap	r 5,039	5,103	West Germany 4,326.
Semimanufactures	8,369	8,175	Sweden 1,401; Israel 1,101; Bulgaria 1,023.
Gold and gold alloys troy ounces	6,848	8,070	West Germany 6,462; Italy 1,125.
Iron and steel:			
Iron ore and roasted pyrites	515	122	Belgium-Luxembourg 80.
Ashes and residues. thousand tons	107	116	All to West Germany.
Scrap do	4	6	Switzerland 3; West Germany 2.
Pig iron and ferroalloys do	55	5	West Germany 2; Sweden 1.
Steel ingots and other primary forms. thousand tons	386	400	West Germany 355.
Semimanufactures:			
Iron and steel shapes do	163	191	Bulgaria 34; Italy 25; West Germany 25; Switzerland 21; Hungary 12.
Plates and sheets do	466	472	U.S.S.R. 99; West Germany 88; Czechoslovakia 49.
Hoop and strip do	59	61	Switzerland 27; Italy 10; Rumania 5.
Other do	112	114	Switzerland 30; West Germany 16; Hungary 11.
Lead:			
Lead oxides	547	1,547	Czechoslovakia 1,306.
Metal and alloys all forms	r 2,767	1,997	Italy 1,553.
Magnesium, all forms	r 424	336	West Germany 165; United Kingdom 90.
Manganese oxide	481	363	West Germany 140; Denmark 122; Brazil 71.
Mercury 76-pound flasks	157	293	France 171; West Germany 55.
Molybdenum, all forms	240	281	West Germany 123; United Kingdom 79; United States 24.
Nickel and alloys, all forms	243	203	West Germany 89; East Germany 27; Rumania 26.
Platinum group metals troy ounces	4,115	6,302	Rumania 4,115; Italy 900; Hungary 482; West Germany 450.
Silver and alloys:			
Bullion thousand troy ounces	96	145	Nearly all to West Germany.
Semimanufactures do	32	35	Rumania 13; Yugoslavia 6; Czechoslovakia 6.
Tantalum, all forms kilograms	3,200	4,000	United Kingdom 2,000; West Germany 1,300.
Tin:			
Oxide long tons	70	137	Czechoslovakia 86; Poland 44.
Metal all alloys, all forms do	41	26	West Germany 20.
Tungsten:			
Ore and concentrate	192	101	All to West Germany.
Metal, all forms	87	119	West Germany 84; France 9; East Germany 8.

See footnotes at end of table.

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Table 2.—Austria: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Zinc:			
Ore and concentrate	r 54	-------	
Metal and alloys, all forms	4,233	3,892	Italy 2,034; Czechoslovakia 1,600.
Other:			
Nonferrous ores, n.e.s.	166	93	West Germany 90.
Ashes and slag, n.e.s.	12,415	14,289	Italy 6,099; West Germany 4,887; Yugoslavia 2,724.
Salts and compounds of unspecified rare earth elements.	133	265	NA.
Nonmetals:			
Asbestos:			
Crude	9	1,701	Belgium-Luxembourg 1,693.
Cement and cement products	13,591	11,007	West Germany 10,722.
Cement, hydraulic	34,441	15,096	West Germany 14,485 Switzerland 548.
Chalk	3,732	3,244	West Germany 2,260; Italy 755.
Clays:			
China clay	30,664	31,487	Italy 19,541; Switzerland 5,294; West Germany 4,365.
Other clays and crude refractories	2,208	1,148	United Kingdom 701; Italy 298.
Cryolite and chiolite, natural	4	4	Mexico 4.
Diatomite and other siliceous earths	138	257	Yugoslavia 144; Bulgaria 70.
Diamond and other gemstones:			
Uncut—thousand carats	20	165	Sweden 100.
Other—do	75	350	United States 245.
Dolomite	41,929	38,748	West Germany 24,232; United Kingdom 9,722.
Feldspar	1,753	2,165	Italy 1,129; Switzerland 643.
Fluorspar	39	-------	
Graphite, natural	21,187	16,876	Italy 7,725; West Germany 6,948.
Gypsum, crude and sintered	59,251	79,728	West Germany 66,177; Switzerland 13,456.
Lime, hydraulic and slaked	345	2,128	West Germany 2,019.
Limestone, industrial	903,078	882,745	West Germany 882,686.
Magnesite:			
Crude	576	412	West Germany 259; Switzerland 107.
Sintered	275,262	223,969	West Germany 90,625; United States 58,670; France 16,174.
Caustic calcined	99,424	91,530	West Germany 72,863.
Bricks and plates	144,775	136,749	West Germany 20,072; France 19,607; Sweden 19,208.
Other products, not burnt, including chrome-magnesite products.	102,038	97,011	West Germany 24,027; Rumania 16,927; France 14,062.
Mica and mica products	19	25	Yugoslavia 12; West Germany 10.
Pigments, mineral	3,226	2,697	West Germany 984; United Kingdon 776.
Quartz and quartzite	279	153	West Germany 82; Netherlands 58.
Rare earth metals and compounds, n.e.s.	r 133	265	NA.
Refractories, n.e.s.	3,870	3,845	Czechoslovakia 2,009; West Germany 665.
Sand (excluding metal bearing)	55,207	43,221	West Germany 30,557; Switzerland 11,618.
Slate	55	61	NA.
Stone, except industrial limestone and slate:			
Building and dimension:			
Crude and partly worked	183,802	177,286	West Germany 118,738; Switzerland 57,310.
Worked	15,660	9,720	Switzerland 5,557; West Germany 4,038.
Crushed stone, gravel and macadam.	189,873	125,286	West Germany 103,152; Switzerland 20,444.
Sulfur	49	-------	
Talc and soapstone	69,490	60,558	West Germany 29,172, Italy 8,078.
Vermiculite and mineral wool	67,102	80,568	West Germany 79,634.
Nonmetals n.e.s.:			
Ceramic scrap	415	329	All to West Germany.
Other	493	813	West Germany 529; Italy 91; Switzerland 83.
Mineral fuels:			
Lignite and briquets	9,967	9,428	West Germany 9,420.
Coke	2,816	10,621	Yugoslavia 7,548; Italy 3,042.
Gas, manufactured	113	7	Switzerland 7.
Petroleum refinery products:			
Distillate fuel oil	r 125,963	24,956	West Germany 24,668.
Lubricants	r 73,530	71,023	Czechoslovakia 26,561; Poland 22,108.
Other	2,692	8,303	Poland 6,030.
Crude chemicals from the distillation of coal, petroleum and natural gas	r 2,889	2,784	West Germany 1,954; Italy 710.

r Revised. NA Not available.

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Table 3.—Austria: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	r 22,895	24,580	Surinam 12,662; Hungary 4,999; Yugoslavia 4,530.
Alumina, including hydroxide	172,427	160,034	West Germany 81,793; Guinea 44,984; Hungary 23,386.
Metal and alloys:			
Ingots, equivalent forms and scrap.	2,266	4,479	Hungary 1,539; East Germany 893; West Germany 717.
Semimanufactures	7,024	7,806	Switzerland 2,744; West Germany 2,713; Italy 1,297.
Antimony metal, all forms	95	115	Belgium-Luxembourg 112.
Arsenic oxides and acids	r 41	47	West Germany 17; France 15; Switzerland 15.
Beryllium metal, all forms. kilograms	200	300	West Germany 200; United Kingdom 100.
Cadmium, all forms	12	8	Mainly from West Germany.
Chromium:			
Chromite	41,223	48,069	Iran 30,800; Turkey 17,207.
Oxides and hydroxide	163	160	West Germany 130.
Copper:			
Ore and concentrate	692	738	All from Italy.
Metal and alloys:			
Scrap	5,313	5,448	West Germany 3,353; Switzerland 1,189.
Blister, ingots and equivalent forms.	23,536	19,952	West Germany 10,867; South Africa 3,456; Zambia 2,362.
Semimanufactures	4,816	5,132	West Germany 2,741; United Kingdom 600.
Gold and gold alloys. thousand troy ounces	r 988	1,164	United Kingdom 866; West Germany 144; Switzerland 121.
Iron and steel:			
Ores and concentrates. thousand tons	1,119	1,175	U.S.S.R. 408; Brazil 352; West Germany 278.
Roasted pyrites do	361	346	Italy 332.
Pig iron and castings [1] do	239	159	U.S.S.R. 34; Hungary 33; Bulgaria 30; East Germany 27.
Ferroalloys:			
Ferromanganese do	r 11	12	Norway 7; U.S.S.R. 2.
Other do	r 35	35	Norway 7; U.S.S.R. 4; France 4; Yugoslavia 3; Sweden 3; New Caledonia 3.
Scrap do	108	55	East Germany 33; Italy 8; West Germany 7.
Steel ingots and other primary forms. do	31	52	Bulgaria 22; Hungary 10; Rumania 8.
Semimanufactures do	189	261	West Germany 153; France 16; Belgium-Luxembourg 16.
Lead:			
Ore and concentrate	4,350	2,600	All from Italy.
Lead oxide	142	91	United Kingdom 41; West Germany 34.
Metal and alloys, all forms	13,055	14,150	Yugoslavia 9,073, Bulgaria 3,242.
Magnesium ingots, scrap and semimanufactures.	r 536	508	Italy 452.
Manganese:			
Ore and concentrate	964	1,306	West Germany 759; China, mainland 201.
Oxides	237	160	Japan 145.
Mercury 76-pound flasks	679	583	Spain 174; West Germany 157; Italy 116.
Molybdenum:			
Oxides	400	537	West Germany 289; United States 153.
Metal, all forms	59	7	West Germany 3; Hungary 3.
Nickel and nickel alloys:			
Matte, speiss	369	737	Canada 335; United Kingdom 274; United States 62.
Ingots and scrap	1,940	2,364	United Kingdom 1,263; Canada 308; U.S.S.R. 300.
Semimanufactures	438	568	West Germany 290; United Kingdom 169.
Platinum group metals, all forms. troy ounces	4,437	5,691	West Germany 4,180; United Kingdom 707; Italy 547.
Silver:			
Bullion thousand troy ounces	3,199	3,778	West Germany 1,791; Switzerland 987; Mexico 482.
Semimanfactures do	154	177	West Germany 84; Switzerland 68.
Tantalum, all forms kilograms	4,800	5,700	United States 3,700; West Germany 1,700.
Tin and tin alloys:			
Unwrought, including scrap. long tons	599	565	Netherlands 344; West Germany 67.
Semimanufactures do	31	41	Switzerland 17; West Germany 13.
Titanium oxide	4,810	5,235	West Germany 3,362; United Kingdom 516; Netherlands 489; Finland 429.

See footnotes at end of table.

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Table 3.—Austria: Imports of mineral commodities—Continued

(Metric tons unless otherwise stated)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Tungsten:			
Ore and concentrate	3,352	3,550	Mainland China 2,235; South Korea 630; Australia 549.
Oxide and hydroxide	205	223	West Germany 131; France 92.
Metal, all forms	34	25	West Germany 10; France 8; United Kingdom 6.
Salts and compounds of uranium, thorium and rare-earth elements.	289	83	West Germany 40; United States 20; France 13.
Zinc:			
Ore and concentrate	12,620	12,450	All from Italy.
Oxide (zinc white)	452	485	West Germany 374; Netherlands 70.
Ingots and equivalent forms	7,403	7,297	Bulgaria 2,560; Poland 1,753; West Germany 1,006.
Semimanufactures	557	637	Yugoslavia 344; West Germany 214.
Nonferrous ores and concentrates not elsewhere specified.	5,166	5,661	Australia 1,704; Canada 1,624; United States 1,393.
Nonferrous ashes and residues n.e.s.	8,269	11,964	West Germany 5,347; Czechoslovakia 2,199; Hungary 2,186.
Other ashes and slags n.e.s.	899	730	West Germany 566.
Nonmetals:			
Abrasives:			
Natural:			
Dust and powder from gem stone. thousand carats	10	40	West Germany 35; Netherlands 5.
Pumice	653	734	West Germany 526; Italy 205.
Emery, corundum and other	108	123	Greece 63; Netherlands 40; West Germany 20.
Artificial corundum	3,392	4,136	West Germany 3,165.
Asbestos:			
Crude	31,102	34,169	Canada 24,109; U.S.S.R. 4,513.
Cement and cement products	8,855	13,106	West Germany 10,333; Switzerland 2,112.
Other products, excluding friction material.	289	538	West Germany 313; United States 98.
Barite and witherite	8,481	5,954	Yugoslavia 2,429; West Germany 2,355.
Boron salts, natural	5,124	5,789	United States 5,748.
Cement, hydraulic	16,007	27,186	Switzerland 8,272; West Germany 5,115; France 5,021.
Chalk	1,122	971	France 498; West Germany 327.
Clays and clay products:			
Clays and refractories, crude	r 149,615	118,474	West Germany 47,498; Czechoslovakia 36,700; Hungary 16,480.
Bricks, tubes and pipes, nonrefractory.	118,376	126,132	Italy 53,990; West Germany 30,420; Hungary 20,166.
Cryolite and chiolite, natural	416	421	All from Denmark.
Diatomite and other siliceous earths	2,190	2,765	United States 1,431; West Germany 1,056.
Dolomite, crude and sintered	3,107	3,295	Italy 2,051; Norway 937.
Gem stones, including industrial diamonds:			
Uncut thousand carats	4,825	56,335	Brazil 24,850; Canada 12,860; Uruguay 5,000; West Germany 4,415.
Other gem stones, crude or cut but not mounted. do	2,410	2,625	West Germany 1,440; India 550.
Industrial diamonds thousand carats	70	35	West Germany 30; Hungary 5.
Graphite; natural	298	234	West Germany 199.
Gypsum and anhydrite, crude and sintered.	11,692	19,473	Poland 9,443; East Germany 7,224.
Lime, hydraulic and slaked	r 1,169	690	West Germany 636.
Limestone, industrial	4,560	444	Switzerland 86; West Germany 60.
Magnesite:			
Crude	20,224	32,314	Turkey 32,269.
Sintered and caustic calcined	17,672	23,417	Turkey 15,007; Greece 8,295.
Magnesite and chrome-magnesite products, unfired.	1,925	1,824	Italy 1,775.
Mica:			
Crude and scrap	r 259	382	Argentina 104; Norway 96; West Germany 72.
Manufactures	18	27	Switzerland 21.
Pigments, mineral	259	283	France, 177; West Germany 43; Italy 42.
Phosphates:			
Phosphate rock:			
Crude	184,989	223,583	Morocco 174,871; United States 46,713.
Ground	47,190	41,142	West Germany 39,565.
Thomas slag	337,184	325,880	France 156,708; Belgium-Luxembourg 137,593.
Other	14,408	6,213	Netherlands 5,628.

See footnotes at end of table.

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Table 3.—Austria: Imports of mineral commodities—Continued

(Metric tons unless otherwise stated)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Potash:			
Crude salts	158,290	123,889	East Germany 123,273.
Potassium chloride	66,137	136,289	France 47,540; West Germany 34,326; U.S.S.R. 32,545; East Germany 21,878.
Potassium sulfate	26,163	17,766	West Germany 14,212; East Germany 1,954; Italy 1,500.
Potassium-magnesium sulfate	31,315	32,575	West Germany 32,555.
Other potash fertilizers	22,328	2,517	U.S.S.R. 2,501.
Pyrites, unroasted	27,680	26,465	U.S.S.R. 15,501; Greece 5,845; Italy 4,941.
Quartz and quartzite	15,233	15,087	West Germany 13,296.
Refractory building materials	15,489	14,261	West Germany 12,148; Czechoslovakia 602.
Salt, including brine salt	63	779	France 728.
Sand, excluding metal-bearing	136,167	141,430	West Germany 89,188; East Germany 22,642.
Slate:			
Crude or rough cut	511	571	West Germany 204; Italy 154; Norway 148.
Slate products	188	257	Italy 181 West Germany 51.
Stone:			
Dimension, except slate	r 24,102	31,175	Italy 18,585.
Crushed stone and gravel	r 97,274	158,771	West Germany 126,568; Italy 17,571.
Sulfur:			
Elemental thousand tons	114	82	United States 39; Poland 18; France 8.
Sublimed	348	154	All from West Germany.
Sulfur dioxide	765	815	All from West Germany.
Sulfuric acid	25,142	4,565	West Germany 4,027.
Talc and soapstone	1,797	1,493	Italy 1,039; Norway 298.
Trass	1,177	1,854	All from West Germay.
Vermiculite and mineral wool	1,383	19,671	Switzerland 13,747; Italy 3,098.
Other nonmetals, n.e.s.:			
Ceramic scrap	11,073	7,080	West Germany 5,063; Czechoslovakia 1,690.
Other	24,067	21,255	West Germany 18,380; Poland 1,250.
Mineral fuels:			
Coal and briquets:			
Bituminous and anthracite thousand tons	3,628	3,405	Poland 1,415; U.S.S.R. 845; West Germany 769; Czechoslovakia 271.
Subbituminous and lignite do	695	538	East Germany 327; West Germany 175; Czechoslovakia 24.
Peat do	9	15	West Germany 7; Poland 7.
Coke and coke breeze do	965	990	West Germany 391; Czechoslovakia 263.
Natural asphalt, bitumen, etc do	1,846	1,333	United States 799; Trinidad and Tobago 461.
Gas:			
Natural, including LPG	2,278	2,854	Yugoslavia 2,674.
Manufactured	1,466	1,351	West Germany 1,348.
Petroleum:			
Crude and partly refined thousand tons	789	1,276	U.S.S.R. 699; Yugoslavia 363; West Germany 106.
Refinery products:			
Gasoline do	467	602	Italy 332; Czechoslovakia 77; West Germany 73.
Kerosine do	7	8	Italy 6.
Distillate fuels do	104	112	Italy 99; Switzerland 11.
Residual fuel oils do	1,196	1,216	West Germany 271; Czechoslovakia 223; Italy 184; Hungary 182; Poland 153.
Lubricants do	51	57	Netherlands 20; West Germany 12; Italy 10.
Mineral jelly and wax do	8	8	West Germany 4; East Germany 1.
Other products of coal, oil shale, bitumen, and asphalt do	225	435	Hungary 176; Italy 78; Rumania 70; West Germany 58.

r Revised.
1 Includes Spiegeleisen, shot, powder, and sponge.

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COMMODITY REVIEW

METALS

Copper.—After an increase of 18 percent in 1966, the output of copper ore in 1967 showed only a slight further increase. Following development of the recently opened western sector of the Mitterberg vein under Hochkönig mountain, copper ore production is expected to reach 150,000 tons annually (about 2,000 tons of copper content). Recent exploration of the faulted westward extension of the Mitterberg vein indicates possible reserves of about 4 million tons of ore with 1.4 percent copper (as mined) in addition to the 2 million tons already outlined. According to the Oberste Bergbehoerde, Bundesministerium fuer Handel, Gewerbe und Industrie (Supreme Mining Authority), these reserves could support an operation for producing 180,000 to 200,000 tons of ore annually for 30 years at favorable copper prices.

Lead and Zinc.—Exploration work in the Bleiberg-Kreuth and Rubland areas during recent years has increased estimated proved and probable ore reserves to 7.5 million tons of zinc-lead ore, sufficient to maintain production for 20 years after installation of a planned heavy-media separation plant at the Bleiberg mine.

Tungsten.—While the production of tungsten concentrate does not satisfy the country's requirements for that metal, it does provide a very important source of supply to Austria's ferroalloy industry. The scheelite comes from the Hintertux magnesite mine of the Austrian-American Magnesite Company at Vorder Landersbach (Tux) in Tyrol where it occurs at the contact between magnesite and slate. The ore is concentrated to plus 65 percent WO_3 in a wet gravity concentrator.

MINERAL FUELS

Coal.—The decline in coal and lignite output, which started in 1964, reflects the closing down of several mining operations which was caused partially by the exhaustion of minable reserves and partially by competition from lower cost fuel oil, natural gas, and imported coal.

Natural Gas.—OeMV reached agreement in principle with the U.S.S.R. on Soviet gas deliveries over a period of 20 years at an annual rate of 1,500 million cubic meters, subject to agreement on price, financing, deliveries, and other details. The agreement reportedly includes the provision of about 500,000 tons of large-diameter pipe by VOEST, the Austrian steel company; the advance of credits by an Austrian banking consortium; and the use of gas deliveries to serve, in part, to pay for the pipe. Pending completion of the pipeline, OeMV reportedly proposed that deliveries at the initial rate of 500 million cubic meters per year should begin in 1968 through a 64 kilometer extension to be laid from the existing gas pipeline from the Ukraine to Czechoslovakia.

There have been alternative proposals for the supply of gas from the Netherlands via West Germany or from Algeria by tanker to Koper in Yugoslavia and thence by pipeline.

Unless imports can be arranged in the near future, gas consumption may have to be curtailed because indigenous reserves will not justify the rates of gas production maintained in recent years.

Petroleum.—Improved transportation facilities on the Danube River made it possible to conserve domestic production of petroleum in favor of increased imports.

Agreement was reached in July 1967 between the Allgemeine Oesterreichische Mineralverwaltung Aktiengesellschaft (General Austrian Oil Administration—OeMV) and the foreign oil companies operating in Austria for the joint construction of a major pipeline to supply crude for the Austrian market. It was planned to begin construction in 1968 and complete the line by mid–1969. The pipeline will be owned by Adria-Wien-Pipeline GmbH (AWP) in which OeMV has a 51 percent share; Shell 14.5 percent; Mobil 12.5 percent; British Petroleum 7.5 percent; Esso 6.5 percent; and Total and ENI 4 percent each. It will be built as a spur from the Trans-Alpine pipeline at Wurmlach in Carinthia to Schwechat near Vienna where OeMV operates the country's only large-scale refinery. Initial capacity of the 400-kilometer, 18-inch line will be 3.5 million tons per year, but sufficient capacity exists to allow for eventual expansion to 10 million tons.

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Other details of the agreement provide for the oil companies forming the minority of AWP shareholders to have substantial quantities of crude refined for themselves at Schwechat and also to purchase products from the refinery; this undertaking will run for 13 years from the opening of the pipeline and will cover 31 million tons of oil. The agreement also envisaged the construction of a jointly owned refinery at Wildon near Graz on the pipeline route with a capacity of 2 to 3 million tons per year and the possible construction of up to three other refineries. OeMV is to be offered a 26-percent share of all new refineries to be built by the AWP partners until 1980, and capacity at Schwechat is to be increased by 2 million tons per year by 1970.

Total refinery capacity amounted to 97,100 barrels per day in 1967, distributed as follows: OeMV-Schwechat 88,000 barrels; Shell Austria A.G.-Floridsdorf 4,600 barrels; Mobil Oil Austria A.G.-Kagran 4,500 barrels.

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The Mineral Industry of Belgium and Luxembourg

By Roman V. Sondermayer [1]

As in previous years, the mineral industry of Belgium-Luxembourg was primarily devoted to processing imported raw materials with ferrous and nonferrous metallurgy and petroleum refining the principal activities. Belgium-Luxembourg remained an important supplier of iron and steel, copper, lead, and zinc, mostly to other European countries. Traditionally, Belgium has had a more diversified mineral industry; Luxembourg has been primarily oriented to iron and steel production, with a lesser output of construction materials.

BELGIUM

Most of the metals produced in Belgium were exported; therefore, the minerals industry accounted for a large share of the country's foreign exchange earnings in 1967. Coal, construction materials, and quarry products were the only minerals mined in the country, and their significance was primarily domestic.

The production pattern for the Belgian mineral industry showed no clear trend in 1967; output of some commodities moved up from 1966 levels while that of others declined. The decline in Belgium's coal output continued, and resulted from lower demand for high priced Belgian coal which could not meet the competition of liquid fuels, natural gas, and foreign coal.

The 3-percent growth in the gross national product (GNP) in 1967 was below the 5-percent annual rate of increase in the early 1960's. Exact figures for the share of Belgium's mineral industry in the total GNP were not available for 1967; however, there were indications that the past downward trend continued and that the share in the total GNP was about 4 percent. In 1967 the mineral industry employed about 135,000 persons.

Important events occurred in steel, nonferrous metallurgy, and petroleum refining during 1967. A new steel mill at Zelzate, near Ghent, operated by "SIDMAR" (Siderurgie Maritime S.A.) was completed. One of the world's largest zinc producers, Vieille-Montagne Co., (Société des Mines et Fonderies de Zinc de la Vieille Montagne) started production in a new zinc electrolytic plant at Balen. Texaco Inc. was building a new 100,000-barrel-per-day refinery in Ghent.

Foreign trade activity appears to have slowed during 1967. The mineral industry of Belgium had a positive trade balance of $429.8 million in 1966, the last year for which data were available. However, the positive trade balance in 1965 was $562.6 million, and results in 1966 represent a decline of $132.8 million, which occurred presumably because of higher imports of petroleum and petroleum products.

PRODUCTION

Other than coal, the Belgian mining industry was confined to exploitation of construction materials. Domestic requirements for this type of commodity have been met at competitive prices because of the generally high level of mining technology.

Although most of the nonferrous metals were produced in larger quantities than in 1966, zinc production fell slightly. Coal output in 1967 declined by about 1 million tons. Steel output rose by about 800,000 tons.

[1] Foreign minerals specialist, Division of International Activities.

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Table 1.—Belgium: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p [1]
Metals:					
Aluminum:					
Secondary	3,547	3,460	3,192	2,545	NA
Semimanufactures	86,232	128,456	135,538	172,487	143,853
Cadmium (exports)	881	843	385	146	NA
Copper:					
Refined, including secondary	271,444	286,129	309,356	303,427	317,873
Semimanufactures	124,080	153,852	168,470	146,681	132,320
Iron and steel:					
Iron ore thousand tons	96	61	91	124	88
Pig iron and ferroalloys do	r 6,958	r 8,122	r 8,436	r 8,302	8,902
Steel:					
Ingots and castings do	7,528	8,731	9,169	8,917	9,716
Semimanufactures do	5,769	6,475	6,947	6,865	7,511
Lead:					
Smelter, including secondary	98,433	83,316	110,757	92,659	107,800
Semimanufactures	26,844	25,980	26,633	25,923	24,879
Precious metals:					
Unworked [2] thousand troy ounces	12,965	13,622	14,163	14,499	15,561
Semimanufactures do	609	668	803	867	739
Tin:					
Smelter, including secondary long tons	8,280	6,804	5,227	6,576	6,068
Semimanufactures do	689	787	700	1,100	617
Selenium (exports)	25	40	42	41	NA
Zinc:					
Smelter, including secondary	206,328	222,540	239,800	251,700	227,328
Semimanufactures	43,800	46,300	e 46,200	e 46,600	51,949
Other nonferrous metals [3]	4,418	4,222	4,348	4,608	3,950
Nonmetals:					
Cement thousand tons	4,709	5,846	5,905	5,796	5,820
Clays do	270	203	209	181	167
Dolomite:					
Raw do	649	908	860	804	954
Calcined do	321	337	315	319	304
Fertilizer raw materials:					
Phosphates	13,335	22,055	e 22,000	e 22,000	NA
Thomas slag thousand tons	1,337	1,622	NA	NA	NA
Flint	12,004	14,924	NA	4,851	5,265
Lime [4] thousand tons	2,016	2,299	2,292	2,232	2,284
Plaster	77,274	91,236	74,919	77,124	73,295
Quarry products:					
Limestone thousand tons	8,127	9,899	10,205	11,347	14,087
Other calcareous [5] do	829	1,010	1,069	1,015	952
Marble:					
In blocks cubic meters	6,946	7,272	7,098	7,406	5,090
Slabbed, including worked [6]	9,150	11,280	11,540	11,910	8,641
Crushed and other	30,050	32,824	32,974	25,171	33,403
Petit granit (Belgian bluestone):					
Quarried cubic meters	311,391	409,602	326,826	288,552	286,708
Sawed do	28,908	104,633	77,483	80,000	75,930
Worked do	12,366	32,296	18,275	20,974	16,341
Crushed and others do	287,087	381,971	287,036	261,456	232,903
Porphyry, rough cut and crushed thousand tons	4,290	5,355	5,109	4,185	5,523
Quartz and quartzite	350,690	304,572	304,572	260,532	297,769
Sand and gravel:					
Construction sand thousand tons	3,082	5,171	4,254	4,375	4,467
Foundry sand do	1,137	1,379	1,266	1,161	1,089
Glass sand do	1,634	1,332	1,461	1,392	1,530
Other sand, including dredged do	1,863	2,765	2,771	1,257	1,141
Gravel (dredged)	5,144	7,844	6,527	4,361	5,367
Sandstone:					
Rough stone, including crushed thousand tons	1,253	1,547	1,369	1,353	1,445
Paving and mosaic stone do	8	8	17	13	9
Other do	79	86	81	77	107
Slate, roofing and other	11,444	11,750	10,931	10,290	NA
Whetstone	52	49	41	45	NA
Sulfur:					
Recovered	5,000	5,000	NA	NA	NA
Sulfuric acid, 100 percent thousand tons	1,236	1,348	1,487	1,362	NA
Mineral fuels:					
Coal:					
Anthracite thousand tons	5,986	6,062	5,438	4,952	4,993
Bituminous and semibituminous do	15,432	15,242	14,348	12,547	11,442
Briquets do	2,294	1,433	1,074	e 1,050	867
Coke (all kinds) do	7,204	7,229	7,334	6,961	6,857
Manufactured gas [7] million cubic meters	3,756	4,001	4,109	NA	1,753

See footnotes at end of table.

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Table 1.—Belgium: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1963	1964	1965	1966	1967 p [1]
Mineral fuels—Continued						
Petroleum refinery products:						
Gasoline, all kinds	thousand tons	1,711	1,864	2,206	2,158	2,024
Kerosine and jet fuel	do	329	429	493	560	302
Distillate fuel oil	do	3,762	4,162	4,759	4,779	2,605
Residual fuel oil	do	3,952	4,283	5,351	5,685	7,635
Bitumen	do	481	512	411	462	513
Lubricants	do	31	37	44	39	42
Liquefied petroleum gas [8]	do	336	373	449	510	507
Other	do	785	914	1,087	1,555	2,662
Total	do	11,387	12,574	14,800	15,748	16,290
Refinery fuel and loss	do	783	775	798	874	996

e Estimate. r Revised. p Preliminary. NA Not available.

[1] Source: U.S. Embassy, Brussels. State Department Airgram A-650, Apr. 30, 1968. Royaume de Belgique, Minstere des Affaires Economique, Administration des Mines, Service: Statistiques. Bruxelles, Annee 1967.
[2] 80 to 90 percent silver.
[3] Includes antimony, cadmium cobalt, nickel, and other unspecified metals.
[4] Not including annual production of artificial hydraulic lime (5,000 to 6,000 tons per year in 1962–63 and 8,582 tons in 1964).
[5] Including chalk, marl, and travertine.
[6] Converted from production data in thousand square meters of 20-millimeter slabs.
[7] Coke oven and gas plant gas; gross output including gas for captive consumption; includes gas produced from hydrocarbons.
[8] Includes commercialized refinery gas.

TRADE

The foreign trade of Belgium is incorporated with that of Luxembourg in the official returns of Belgium-Luxembourg Economic Union (BLEU).

Minerals continued to occupy an important position in Belgium-Luxembourg's total trade in both exports and imports, as evidenced by the following tabulation for 1965 and 1966, the latest years for which detailed data were available:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	2,476.6	6,381.6	38.8
1966	2,610.3	6,829.0	38.2
Imports:			
1965	1,914.1	6,373.5	30.0
1966	2,180.5	7,174.0	30.3
Trade balance:			
1965	+562.5	+8.1	XX
1966	+429.8	−345.0	XX

X Not applicable.

Source: Statistical Office of the United Nations.

France was the foremost recipient of Belgium-Luxemburg's mineral exports in 1966, receiving goods valued at about $480.7 million while West Germany ranked a close second (0477.3 million), Netherlands third ($385.2 million), and the United States fourth (343.0 million). West Germany ranked first as a source of Belgium-Luxembourg's mineral imports, supplying materials valued at $313 million in 1966, followed by Congo (Kinshasa) ($299.4 million), France ($269.1 million), United Kingdom ($228.8 million), Netherlands (197.7 million), and the United States ($100.6 million).

The largest commodity group among Belgium-Luxembourg's mineral exports were products of the iron and steel industry (of which Luxembourg contributed a significant share), with a reported value of $1,100.1 million, followed by products of the copper industry ($408.6 million); diamonds, precious stones, and gems ($359.0 million), and petroleum refinery products ($158.6 million).

Among Belgium-Luxemburg's imports petroleum and refinery products were the largest commodity group, accounting for $356.2 million, followed by copper ($351.0 million), and by precious stones ($355.0 million).

COMMODITY REVIEW

Metals.—*Aluminum.*—During 1967 there was no primary aluminum production in Belgium and the output of secondary aluminum metal was insignificant. The output of aluminum semimanufactures,

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Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals: [1]			
Aluminum:			
Bauxite	-------	320	All to France.
Scrap	8,496	8,417	France 3,062; West Germany 3,056; Netherlands 1,391.
Ingots	2,358	3,176	West Germany 2,063; France 640.
Semimanufactures	93,390	123,510	United States 43,206; Netherlands 16,171; West Germany 14,039.
Bismuth [2]	85	116	France 82; West Germany 15.
Cadmium	735	681	West Germany 309; France 131.
Chromite	11	6	NA.
Copper:			
Ore	-------	7,300	All to West Germany.
Scrap	16,302	17,934	West Germany 8,342; France 3,566; Netherlands 2,676; Italy 1,785.
Metal alloys unwrought	263,159	262,983	France 102,050; Netherlands 50,702; West Germany 35,522.
Metal, alloys, worked	90,169	81,287	Netherlands 30,653; West Germany 19,141; United States 6,502.
Germanium, metal ---kilograms	6,300	5,100	West Germany 2,800.
Gold, and alloys including semimanufactures. ---thousand troy ounces	55	1,078	NA.
Iron and steel:			
Iron ore ---thousand tons	67	22	France 21.
Pyrite cinder ---do	199	210	West Germany 209.
Blast furnace slag and waste ---do	1,879	-------	
Scrap ---do	720	741	France 325; West Germany 264; Netherlands 100.
Pig iron, including cast iron, sponge, powder. ---do	80	75	France 34; West Germany 27; Italy 8.
Ferroalloys, including spiegeleisen. ---do	47	69	Italy 15; France 14; West Germany 7.
Ingots and other primary forms. ---do	1,201	1,149	France 515; West Germany 245; Italy 98.
Semimanufactures:			
Shapes (bars, rods, angles, shapes, sections). ---do	4,377	4,062	United States 1,075; West Germany 816; Netherlands 567; France 435.
Universals, plate, sheet ---do	2,679	2,656	West Germany 781; France 666; Netherlands 183.
Hoop and strip ---do	739	714	West Germany 193; France 157; Netherlands 84.
Railway material ---do	116	81	Netherlands 12 United States 12; France 8.
Wire ---do	318	324	United States 107; West Germany 43.
Tubes, pipes, fittings ---do	246	226	Netherlands 63; West Germany 32; France 30.
Castings ---do	24	30	Sweden 9; West Germany 7; Netherlands 4.
Lead:			
Ore and concentrate	263	6,521	Japan 3,197; West Germany 3,050.
Ashes and residues containing lead	2,108	10,753	Netherlands 8,232; West Germany 2,147.
Scrap	2,239	2,264	France 1,652 West Germany 509.
Pig	71,810	56,951	Netherlands 24,071; West Germany 14,901; France 7,011.
Semimanufactures	7,863	8,114	Netherlands 2,670; West Germany 1,948; Sweden 729.
Magnesium [2]	451	391	United States 225; Canada 96.
Manganese ore	7,516	1,221	United Kingdom 1,056.
Mercury ---76-pound flasks	319	401	Netherlands 177; France 91; West Germany 85.
Molybdenum, metal [2] ---koilgrams	4,900	-------	
Nickel:			
Matte	-------	174	France 148; Italy 25.
Unwrought [2]	470	486	Netherlands 130; West Germany 116; United Kingdom 82.
Semimanufactures [3]	166	262	Netherlands 112; West Germany 98.
Platinum and platinum-group metals all forms. ---thousand troy ounces	NA	1,057	United States 220; France 206; Netherlands 165.
Selenium ---kilograms	42,200	41,400	West Germany 11,800; Poland 7,400; Italy 5,200; Hungary 3,000.
Silver, unwrought, partly worked. ---thousand troy ounces	8,131	9,214	Netherlands 3,401; West Germany 3,176; France 1,832.
Tellurium and arsenic ---kilograms	4,800	NA	
Tin:			
Ore and concentrate ---long-tons	48	52	All to Spain.
Scrap ---do	223	174	Netherlands 85; West Germany 33; Spain 21.

See footnotes at end of table.

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Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Tin—Continued			
Ingot ---do---	4,110	3,660	West Germany 1,153; France 1,124; Netherlands 617.
Semimanufactures ---do---	179	243	Spain 198.
Titanium, vanadium, molybdenum, tantalum, and zirconium ores.	59	150	United States 110.
Tungsten			
Ore	25	25	West Germany 12; United States 11.
Metal [1]	3	3	Netherlands 2.
Uranium and thorium, other radioactive materials. kilograms	3,100	NA	
Zinc:			
Ore	12,247	12,758	France 10,567; Netherlands 2,190.
Ashes and residues containing zinc	19,987	20,660	West Germany 11,300; Netherlands 6,360.
Scrap	7,474	7,676	France 6,977; Italy 496.
Metal alloys unwrought	129,656	147,320	West Germany 51,598; United States 24,363; France 12,696.
Dust (blue powder)	16,436	15,381	France 3,925; West Germany 3,911; Italy 2,600.
Semimanufactures	17,223	14,586	West Germany 4,183; Netherlands 2,385; France 2,218.
Other nonferrous ores	9	510	All to Netherlands.
Other nonferrous waste and scrap	170,151	-------	
Other base metals	10,305	13,484	United States 7,040; Japan 1,917.
Nonmetals:			
Barite	212	-------	
Building stone:			
Marble ---thousand tons---	915	967	Netherlands 946; West Germany 10.
Calcareous stones ---do---	930	794	Netherlands 628; France 153.
Other, including worked ---do---	265	147	Netherlands 141.
Cement ---do---	1,726	1,424	Netherlands 1,138; West Germany 81.
Chalk	77,866	85,679	Netherlands 50,084; France 11,497.
Clays, crude:			
Kaolin	406	936	NA.
Nonrefractory	25,208	18,650	France 11,010; Netherlands 6,822.
Refractory	12,616	8,171	France 5,598; Netherlands 2,341.
Clay construction materials:			
Nonrefractory ---thousand tons---	212	178	Netherlands 96; West Germany 36; France 32.
Refractory	45,068	38,390	France 24,718; Netherlands 6,927.
Diamond:			
Industrial, including worked. thousand carats	8,139	9,989	United Kingdom 3,993; United States 2,037.
Gem:			
Rough ---do---	1,235	2,085	India 967; Israel 270.
Polished ---do---	1,561	1,646	United States 667; Hong Kong 219.
Diatomite	941	852	NA.
Dolomite ---thousand tons---	551	475	Netherlands 289; France 164.
Fertilizer materials:			
Nitrogenous:			
Sodium nitrate, natural	-------	575	Lebanon 556.
Manufactured ---thousand tons---	763	620	West Germany 185; France 113; mainland China 104.
Phosphatic:			
Phosphate rock	31,203	30,898	France 10,507; Netherlands 9,850; United Kingdom 4,737.
Basic slag ---thousand tons---	1,873	1,767	France 593; West Germany 539; Netherlands 166.
Manufactured ---do---	220	151	France 90; Turkey 20; Netherlands 10.
Potassic:			
Potassium salts bulk	322	2,375	Not reported by countries; all from EEC countries.
Manufactured ---thousand tons---	923	846	NA.
Others manufactured ---do---	360	331	Norway 18.
Fluorspar	13	10	NA.
Graphite	8	-------	
Gypsum and plasters	16,464	14,314	Netherlands 14,314.
Lime ---thousand tons---	353	373	Netherlands 297; France 75.
Limestone ---do---	914	-------	
Lithium minerals	26	-------	
Mica	14	30	NA.
Quartz and quartzite	63,667	64,776	Netherlands 28,714; West Germany 7,399; France 7,399.
Salt	3,448	4,259	France 4,114.

See footnotes at end of table.

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Table 2.—Belgium-Luxembourg: Exports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals—Continued			
Sand, gravel, crushed stone:			
Sand—thousand tons	3,224	3,194	France 1,086; Netherlands 584; West Germany 411.
Gravel and crushed stone—do	5,792	4,903	Netherlands 2,242; France 2,220.
Sulfur	8,084	9,440	Kenya 1,593; United Arab Republic 977.
Talc	-------	1,511	Sweden 515; France 224; Norway 172.
Mineral fuels:			
Asphalt and bitumen (natural)	249	373	NA.
Coal—thousand tons	1,846	1,217	Netherlands 579; France 299; West Germany 213.
Briquets—do	131	103	France 87; Netherlands 7.
Coke (from coal)—do	511	420	France 192; Sweden 84; West Germany 67.
Petroleum:			
Crude—thousand tons	-------	160	All to West Germany.
Refinery products (including bunkers):			
Gasoline—thousand tons	862	853	Netherlands 237; West Germany 234; United Kingdom 217.
Kerosine, including white spirit.—do	442	486	Netherlands 212; West Germany 144.
Distillate fuel oils—do	1,528	1,365	West Germany 352; Netherlands 346; Switzerland 267.
Residual fuel oils—do	2,148	2,415	Bunkers 1,554; Netherlands 380; United Kingdom 98.
Lubricants—do	165	165	Netherlands 55; Switzerland 22; West Germany 16.
Petrolatum and wax	473	442	Italy 97; Cameroons 93; Turkey 61.
Petroleum coke	25,633	27,266	United Kingdom 13,256; Norway 6,582; Sweden 4,768.
Liquefied petroleum gas and other gaseous hydrocarbons.—thousand tons	50	58	France 19; United Kingdom 14; Spain 13.
Bitumen and other [4]—do	207	224	Netherlands 117; West Germany 55.
Carbon black	4,414	4,052	Austria 2,367; Czechoslovakia 497.

NA Not available.
[1] Generally, includes alloys.
[2] Including scrap.
[3] Does not include anodes, which are unreported.
[4] Including bituminous mixtures.

Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals: [1]			
Aluminum and aluminum alloys:			
Bauxite	7,244	9,699	British Guiana 5,865; West Germany 2,715.
Alumina	11,117	13,289	West Germany 6,566; France 5,254.
Scrap	3,772	1,793	France 895; Netherlands 676; Hungary 483.
Unwrought	117,020	152,550	France 100,296; U.S.S.R. 8,580; West Germany 8,452.
Semimanufactures	18,668	25,260	West Germany 10,653; France 8,452.
Antimony:			
Ore	NA	7,930	Bolivia 4,750; mainland China 1,375.
Metal, all kinds	113	104	Mainland China 90.
Beryllium, all forms—kilograms	100	200	United States 100.
Bismuth [2]	38	99	Canada 58; Netherlands 27.
Cadmium	332	521	Congo (Kinshasa) 353; Netherlands 65.
Chromium:			
Ore and concentrate	987	1,710	Philippines 514; Mozambique 482.
Oxide and hydroxide	353	390	West Germany 210; France 93; U.S.S.R. 41.
Metal	NA	11	Not reported by country; all from European Economic Community.

See footnotes at end of table.

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Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Cobalt:			
Oxides and hydroxides..kilograms..	500	1,600	All from United Kingdom.
Copper:			
Ore and concentrate	2,227	12,146	Peru 7,188; Cuba 3,315; Mozambique 673.
Scrap, including alloys	67,674	56,852	Netherlands 16,036; West Germany 14,881; France 11,159.
Ingot, including alloys	317,383	343,952	Congo (Kinshasa) 220,627; Republic of South Africa 26,964.
Semimanufactures, including alloys	9,024	8,304	West Germany 3,374; Netherlands 2,360; France 1,372.
Germanium [1]	26	31	Not reported by country; all from European Economic Community.
Gold and gold alloys:			
Unwrought..troy ounces..	1,321,395	1,250,562	United Kingdom 743,135; Switzerland 327,478.
Semimanufactures..do..	16,075	66,195	Congo (Kinshasa) 14,897; France 13,768; United States 9,413.
Iron and steel:			
Iron ore and concentrate. thousand tons..	13,745	11,407	Sweden 5,206; France 3,041; Liberia 900.
Pyrite cinder..do..	154	145	France 79; Italy 50; West Germany 6.
Blast furnace slag and waste..do..	235	210	West Germany 83; France 67; Netherlands 60.
Scrap..do..	145	193	Netherlands 83; France 49; West Germany 24.
Pig iron, including cast iron sponge, powder, etc. do..	r 231	210	West Germany 68; East Germany 50; Netherlands 27.
Ferroalloys, including spiegeleisen. do..	119	116	France 47; Norway 38; West Germany 12.
Ingots and other primary forms. do..	433	632	Netherlands 254; France 176.
Semimanufactures:			
Shapes (bars, rods, angles, shapes, sections). do..	353	379	France 187; West Germany 118.
Universals, plate, sheet..do..	261	406	West Germany 264; France 82.
Hoop and strip..do..	28	34	France 14; West Germany 14; Netherlands 3.
Railway material..do..	4	8	West Germany 4; France 3.
Wire..do..	11	11	West Germany 5; France 3.
Tubes, pipes, fittings..do..	58	77	West Germany 33; Netherlands 21; France 13.
Castings..do..	3	4	Netherlands 2; France 1.
Lead:			
Ore	197,449	184,537	Republic of South Africa 85,861; Canada 55,422.
Oxides	1,489	2,258	Netherlands 1,406.
Ashes and residues containing lead.	35,522	41,847	Canada 7,908; Australia 6,319; West Germany 6,225.
Scrap	20,965	13,502	West Germany 5,969; Netheralnds 4,473.
Unwrought, including alloys	14,635	13,765	Netherlands 8,440; West Germany 2,935.
Semimanufactures	914	1,348	West Germany 994; Netherlands 184.
Magnesium:			
Scrap	387	330	West Germany 210; Netherlands 61; Austria 8.
Ingot	718	1,091	Italy 492; Norway 204; U.S.S.R. 169.
Semimanufactures	48	54	Austria 7.
Manganese:			
Ore	310,369	258,890	Republic of South Africa 95,130; U.S.S.R.39,689; Angola 38,401; India 23,831.
Oxide	1,859	1,552	Netherlands 1,822.
Mercury..76-pound flasks..	3,568	1,363	Spain 522; Italy 377.
Molybdenum, metal including semimanufactures [2].	20	10	Netherlands 5; United States 2.
Nickel:			
Matte, speiss	28	1,213	United Kingdom 952; Norway 156.
Scrap	531	559	France 258; West Germany 168.
Ingot, including alloys	1,187	170	United Kingdom 77; West Germany 56.
Semimanufactures	689	705	United Kingdom 218; West Germany 166; France 133.

See footnotes at end of table.

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Table 3.—Belgium-Luxembourg: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Platinum and related metals. troy ounces	57,871	25,926	United Kingdom 9,432; France 7,015.
Phosphorus	343	322	West Germany 277; France 15.
Selenium kilograms	300	300	NA.
Silver, metal, unwrought and partly wrought. thousand troy ounces	7,787	14,348	United Kingdom 10,866; Netherlands 1,672.
Tantalum [2] kilograms	200	W	
Tellurium and arsenic	33	30	NA.
Tin:			
Ore long tons	5,616	6,906	Congo (Kinshasa) 5,564; Rwanda 1,332.
Scrap do	1	23	Netherlands 18.
Ingots, including alloys do	2,380	3,255	Congo (Kinshasa) 1,707; Netherlands 1,080.
Semimanufactures do	152	191	Netherlands 93; West Germany 76; France 11.
Oxide do	25	14	West Germany 8.
Titanium oxides	8,407	10,300	West Germany 5,713; Japan 1,468.
Titanium, vanadium, molybdenum, tantalum, zirconium ores.	3,904	5,521	United States 1,992; Canada 591.
Tungsten:			
Ore	43	87	South Korea 22; Congo (Kinshasa) 11.
Metal, including semimanufactures [2].	247	13	Netherlands 8; United Kingdom 3.
Uranium and thorium:			
Ore kilograms	22,000	NA	
Metal, including alloys do	100	NA	
Zinc:			
Ore	509,775	538,637	Canada 274,765; Congo (Kinshasa) 78,660; Finland 56,590.
Ashes and residues containing zinc	50,535	58,947	West Germany 22,649; Netherlands 4,340; France 4,120.
Oxide and peroxide	1,803	1,825	Netherlands 913; United States 296.
Scrap	1,421	704	West Germany 385; Netherlands 221.
Dust (blue powder)	235	341	West Germany 305; United Kingdom 23.
Slab	12,281	11,630	Australia 4,667.
Semimanufactures	164	212	West Germany 111; Netherlands 92.
Zirconium [2] kilograms	900	500	All from West Germany.
Other metals	r 9,105	13,291	Congo (Kinshasa) 12,546.
Other ores	10,781	12,891	Morocco 4,964; Bolivia 4,610.
Other nonferrous waste and ashes	111,798	66,145	West Germany 33,409; Canada 12,214.
Nonmetals:			
Abrasives, natural	210,829	172,368	West Germany 171,410.
Asbestos	61,026	52,514	Canada 31,811; U.S.S.R. 6,589.
Barite, including witherite	25,641	14,912	West Germany 7,749; France 3,125.
Borates, crude	1,508	11,819	United States 5,824; Netherlands 5,231.
Bromine kilograms	13,600	20,300	NA.
Building stone, marble and other calcareous stones.	103,428	82,008	France 35,731; Italy 19,136.
Cement	24,028	43,867	France 17,463; West Germany 12,460.
Chalk	40,818	54,849	France 32,826; Netherlands 21,133.
Clays, crude:			
Kaolin	64,560	93,493	United Kingdom 73,513.
Refractory	143,729	123,421	West Germany 67,617; France 34,921.
Others	153,528	145,595	West Germany 103,968.
Clay construction materials:			
Refractory	78,748	72,084	West Germany 42,605; France 9,692.
Nonrefractory	117,270	152,216	Netherlands 75,778; West Germany 38,334.
Cryolite, natural	143	138	Denmark 126.
Diamond:			
Industrial, including worked. thousand carats	8,827	10,297	United Kingdom 6,237; United States 636.
Gem:			
Rough stones do	5,764	7,134	United Kingdom 5,782.
Worked do	485	566	Israel 136; India 112; Republic of South Africa 85.

See footnotes at end of table.

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Table 3.—Belgium-Luxemburg: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Diatomite	8,529	--------	
Dolomite	19,017	23,487	West Germany 12,646; France 7,518.
Earth pigments	616	635	West Germany 178; France 172.
Feldspar, including leucite, nepheline, etc.	30,400	33,692	Canada 12,600; France 9,200.
Fertilizer materials:			
Nitrogenous:			
Sodium nitrate, natural	16,128	27,668	All from Chile.
Manufactured	151,347	201,105	West Germany 128,542; France 62,403.
Phosphatic:			
Phosphate rock. thousand tons	1,286	1,200	Morocco 980; U.S.S.R. 118.
Manufactured	886	2,277	West Germany 1,390; United States 507.
Potassic:			
Potassium salts	86,624	59,995	France 41,617; West Germany 18,351.
Manufactured. thousand tons	1,345	1,210	France 914; West Germany 160.
Unspecified manufactured	64,964	83,709	France 40,583; West Germany 21,436.
Fluorspar	7,173	6,591	France 2,949.
Graphite	901	627	Austria 234; France 125; Norway 99.
Gypsum and plaster	440,384	449,106	France 413,837; mainland China 2,126.
Lime	94,937	88,641	France 85,426; West Germany 2,300.
Limestone, for flux and cement production.	68,794	79,371	All from France.
Lithium minerals	231	NA	
Magnesite	6,409	3,731	Czechoslovakia 925; Netherlands 887.
Meerschaum, including amber and jet	42	4	Turkey 3.
Mica	1,371	1,202	United Kingdom 373; Norway 254; Malagasy Republic 190.
Precious and semiprecious stones, all kinds:			
Dust and powder. value, thousands	$1,894	$3,016	Ireland $1,808; United States $553.
Pyrites, unroasted	268,078	264,013	Portugal 150,797; U.S.S.R. 38,011.
Quartz and quartzite	14,423	14,056	West Germany 7,216; Norway 2,681; Netherlands 2,658.
Salt. thousand tons	793	847	West Germany 418; Netherlands 348.
Sand, gravel, crushed stone:			
Sand. do	6,345	7,077	Netherlands 6,379; France 399.
Gravel and crushed stone. do	3,554	4,748	West Germany 2,332; Netherlands 1,951; France 423.
Slate, including worked	17,105	13,321	France 6,645; Portugal 2,369; West Germany 2,034.
Sulfur	274,393	219,030	United States 142,731; France 39,749.
Talc and steatite	16,243	36,133	France 16,044; United States 6,967; Austria 5,473.
Other mineral substances	162,442	170,168	Netherlands 74,633; West Germany 45,904; France 35,059.
Mineral fuels:			
Asphalt and bitumen (natural)	3,453	7,427	Netherlands 5,084; Trinidad and Tobago 1,099.
Coal. thousand tons	6,909	6,219	West Germany 3,092; United States 1,617.
Briquets. do	334	346	Netherlands 300; West Germany 45.
Coke (from coal). do	4,064	3,628	West Germany 3,028; Netherlands 531.
Lignite, including briquets. do	199	174	West Germany 167.
Peat, including briquets. do	44	58	Netherlands 39; West Germany 18.
Pitch and pitch coke [3]	17,550	2,689	West Germany 2,427.
Gases, all kinds. thousand tons	246	249	Netherlands 131; West Germany 60; France 43.
Petroleum:			
Crude. do	15,467	16,587	Iran 4,389; Kuwait 3,396; Libya 2,679.
Refinery products:			
Gasoline. do	330	342	Italy 111; West Germany 103.

See footnotes at end of table.

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Table 3.—Belgium-Luxemburg: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1965	1966	Principal sources, 1966
Mineral fuels—Continued				
Petroleum—Continued				
Refinery products—Continued				
Kerosine, including white spirit.	thousand tons	17	33	Netherlands 31.
Distillate fuel oils	do	1,531	1,894	Italy 514; Netherlands 510; Trinidad and Tobago 112.
Residual fuel oils	do	2,185	2,551	Netherlands 893; Italy 738; France 223.
Lubricants	do	215	292	United States 116; Netherlands 52; France 43.
Petrolatum and wax	do	9	10	West Germany 3, France 2; United States 1.
Petroleum coke	do	86	98	United States 95.
Bitumen and other [4]	do	98	43	France 33.
Carbon black		16,978	17,787	Netherlands 5,764; West Germany 5,077; France 4,275; United States 2,107.

r Revised. NA Not available. W Withheld to avoid disclosing individual company confidential data.
[1] Generally, includes alloys.
[2] Including scrap.
[3] From coal and other mineral tars.
[4] Including bituminous mixtures and natural bitumen.

based on imported ingots, was slightly less than 144,000 tons, down considerably from the previous year's level.

During 1967 the Kaiser Aluminum & Chemical Corp. was negotiating with the Belgian Government for construction of a 110,000-ton-per-year aluminum smelter near Liège. If negotiations are successful, about 1,500 workers would be employed and the facility could start production in 1969. Final decision depends on the costs of electricity that will be delivered for alumina reduction.

Copper.—Favorable market conditions brought Belgium's copper output to 318,000 tons in 1967.

The electrolytic copper refinery, operated by Société Géneral Métallurgie de Hoboken, was able to work at a high rate because of diversification of sources of raw copper and scrap. At the same plant, a new complex for continuous smelting of cathodes and casting of wire bars operated at full capacity throughout the year with excellent technical and economic results.

Iron and Steel.—With no significant domestic iron ore production, the Belgian iron and steel industry operated on imported ores, mostly from France and Sweden. Production costs were brought down partly by lower prices paid for Swedish ores and still more by modernization and better utilization of plants.

In the spring of 1967 a new integrated iron and steel plant went into production at Zelzate, near Ghent. The new facility, built at a cost of $97 million, is owned and operated by "SIDMAR". The first blast furnace was blown in during May; the second furnace is expected to start production in 1968. During 1967 the new plant produced 356,335 tons of pig iron and 388,069 tons of ingot steel.

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Table 4.—Belgium: Salient iron and steel statistics

(Thousand metric tons unless otherwise specified)

	1965	1966	1967
PIG IRON			
Number of blast furnaces:			
Available	52	52	51
In operation	43	40	40
Production:			
Pig iron and ferro-alloys	8,366	8,230	8,902
Consumption of raw materials:			
Iron ore, all forms	15,738	15,311	16,326
Manganese ore	199	231	246
Scrap	229	177	164
Coke	5,890	5,691	6,135
STEEL			
Number of steelmaking furnaces:			
Thomas converters:			
Available	51	51	51
In operation	47	47	49
Open hearth furnaces:			
Available	17	11	10
In operation	6	5	4
Electric furnaces:			
Available	29	21	20
In operation	16	14	14
Crude steel capacity	10,470	11,115	12,390
Production of crude steel:			
Thomas	6,894	6,245	6,447
Open hearth	385	249	215
Electric	413	375	347
Oxygen	1,449	2,019	2,688
Other	28	29	19
Total	9,169	8,917	9,716
Consumption of raw materials:			
Pig iron	8,383	8,167	8,799
Scrap	1,888	1,742	1,990
Iron ore	58	60	53
Total employment in iron and steel industry, persons	60,596	57,814	56,860

Lead and Zinc.—The general slowdown in the Belgian lead and zinc industry was accentuated by activities of certain countries which had a surplus of metals, and by abnormal competition which disturbed the market during 1967.

The Société des Mines et Fonderies de Zinc de la Vieille-Montagne, one of the largest zinc producers in Belgium, actively continued its expansion and modernization program. Electrolytic plants at Balen and Viviez were completed, and production of powered zinc was concentrated at Falon. In 1967, 88 percent of total zinc produced by the company was high-purity zinc.

Other Nonferrous Metals.—Because of adverse conditions affecting supply of tin raw materials, output of tin dropped by 8 percent during 1967. Belgium had significant output of cadmium, bismuth, germanium, selenium, and other metals as byproducts of copper, lead, and zinc smelting. Most of these byproduct metals were exported.

Nonmetals.—During 1967, Belgain production of nonmetallics output included cement, clays, lime and quarry products. This sector of the mining industry employed 10,086 persons in 1967.

Barite.—The Dutch concern, Falcon Engineering Co., obtained a concession for the old barite workings near Vierves, whose ore grade is 98 percent barium sulfate. No date for beginning of production was announced.

Cement.—During 1967, production of cement remained at 1965 and 1966 level, and no new plants went on stream. The cement plant at Obourg was converted to use fuel oil instead of coal. Completion of a large clinker furnace will bring the total plant capacity to 2.5 million tons in 1968.

Clays.—Cyprus Corporation completed a processing plant at Ghent for paper coating clay in early spring of 1967.

Diamond, Precious Stones, and Gems.—Trade in all kinds of diamonds and other precious stones and gems continued to be an important exchange earner for Belgium, with 1967 imports valued at $355 million and exports valued at about $359 million.

Fertilizers.—In May 1967 a new fertilizer plant, owned by BASF Antwerpen N.V., was completed at Antwerp with a capacity of 600,000 tons of phosphatic fertilizers. Total investment amounted to an equivalent of about $15 million.

Glass.—A new fiberglass factory at Battice in the province of Liège, owned by Owens-Corning Fiberglass Corp., started production in May 1967. The factory covering 16,000 square meters is one of the most modern plants operated by Owens-Corning, with production process computer controlled.

Mineral Fuels.—The increasing share of liquid fuels and natural gas and the declining share of domestic coal in total energy consumption were continuing characteristics of the mineral fuels industry in 1967.

Coal.—As a result of the coal industry's rationalization programs, the heavily subsidized coal output has been reduced by almost 50 percent from the 30-million-ton level of 1952. Output is scheduled to be cut back to 14.8 million tons in 1968 and to 11 million tons in 1970.

Nine mines were closed during 1967;

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six in the Charleroi, two in the Liège, and one in the Center basin. Closing of mines, and the resulting decline in output, appears to have brought production and consumption in balance, resulting in a significant improvement in mine stock position at year end 1967. Stocks of coal mines dropped to 2.65 million tons from 3.05 million tons reported at the end of 1966. Belgium's coal consumption amounted to 21.5 million tons in 1967. Coking plants and electric powerplants were the principal consumers, using over 50 percent of total consumption.

In 1967 coal exports increased, but imports declined. About 92 percent of the exports went to other members of the European Economic Community. Belgium imports coal from the United States for processing into coke which, in turn, is shipped to steel plants in Luxembourg. Coal imports for this purpose are not subject to the Belgian imports quota.

Petroleum and Natural Gas.—Petroleum and natural gas accounted for 42 percent of Belgium's energy consumption in 1967. Their increase in consumption was well above the rate of increase for the total energy sector. Increased numbers of motor vehicles, the conversion from steam to diesel locomotives, and the introduction of fuel oil for heating in new residential areas were contributing factors. This trend is expected to continue in the future, with consumption of liquid fuels expected to reach over 35 million tons by 1975.

As in past years crude oil requirements were met entirely by imports. Refining and marketing remained the principal activities of the petroleum industry. Although oil companies have shown some interest, no petrochemical industry has developed as yet.

The consumption growth has stimulated refinery building activity. During 1967, five petroleum refineries, with a total capacity of 346,000 barrels per day, were in operation, four near Antwerp and one near Ghent. The largest, operated by Société industrielle Belge des Petroles S.A.[2] had a capacity of 200,000 barrels per day and with an additional 100,000 barrels per day capacity under construction.

Albatros SA was building a new refinery near Antwerp, with a capacity of 60,000 barrels per day. At the same time, Texaco Inc. was in the process of completing a new lube-oil plant at Ghent in addition to its new 100,000 barrel-per-day refinery that will be operational in 1968.

Petrofina, British Petroleum, and Esso are planning to build a crude oil pipeline from Rotterdam, the Netherlands to Antwerp because ports in Belguim are inadequate for the new, large oil tankers.

Under provisions of the Geneva Convention only a small portion of the Continental Shelf was given to Belgium for offshore oil and gas operations. During 1967 the Government submitted to Parliament a bill on the subject of the Belgian Continental Shelf. However by yearend 1967, Parliament had taken no action on the bill. Onshore drilling began in the Hainaut and Deux-Flandres regions and between the cities of Spa and Liège. At yearend no results were reported.

A new trunk pipeline from Popel (Dutch Frontier) brought Dutch natural gas to Belgium. According to Distrigaz, the semigovernmental organization charged with importing and distributing natural gas, the price per calorie of natural gas is half that of manufactured gas. Because natural gas is being imported, conversions were underway to enable use of natural gas in existing facilities. However, it will be some time before the consumers will feel the benefits because of the need to amortize the large financing costs of conversions to natural gas estimated at $100 million by 1971. At yearend 1967 about 113,000 conversions had been carried out.

Electricity and Nuclear Energy.—In 1967 Belgium consumption of electricity totaled 22,500 million kilowatt-hours, and maintained a growth rate close to 5.5 percent. Foreign trade in electricity was again in close balance between exports and imports. Thermal power stations accounted for 98.6 percent of electricity production; of this total coal-fired plants accounted for 62.2 percent, and oil-and gas-fired plants for the remaining 36.4 percent.

The first Franco-Belgium nuclear power station at Chooz, rated at 266 megawatt of electricity output, was progressing towards a normal industrial operation. Preliminary studies for construction of two additional nuclear power plants of 700 megawatts each, at Doel and Tihange, were underway. The Tihange plant will

[2] Owned jointly by British Petroleum (BP) and Petrofina.

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be a Franco-Belgain power station built and operated under same conditions as Chooz.

A workshop has been built at Dessel by Mètallurgie et Mecanique Nucleaire (M.M.N.) for fabrication of fuel elements for nuclear power stations. The work of M.M.N. was on a modest scale during 1967, but the owners expect expansion of activities to match the developments of nuclear powerplants in Europe.

LUXEMBOURG

During 1967, only the iron and steel industry of Luxembourg, with an output of 6 million tons of iron ore and 4 million tons of steel, was significant. Because of its predominant position, the iron and steel industry determined the overall trends in Luxembourg's mineral industry. Production of other minerals, mostly nonmetallic, was significant only in the domestic economy.

Preliminary figures for 1967 indicated an increase of 3 percent in the gross national product (at constant 1966 market prices), roughly the same increase as in 1966. Compared with figures from the early 1960's, the present growth of the GNP indicates a slowdown of the economy, which is also shown by the index of industrial production, which declined by 3 percent in 1967 in terms of annual averages. No recent data exist to show the proportion of GNP accounted for by the mineral extractive and processing industries. However, there is some reason to believe this proportion may be slowly declining because of declining iron ore production, and continuing efforts made to diversify the economy through establishment of other manufacturing industries and services. Foreign trade in minerals was reported together with Belgium.

Table 5.—Luxembourg: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Iron ore	6,990	6,680	6,315	6,528	6,304
Pig iron [1]	3,587	4,191	4,145	3,962	3,963
Crude steel	4,032	4,559	4,585	4,390	4,481
Semimanufactures	3,213	3,589	3,602	3,449	3,531
Nonmetals:					
Cement	203	205	222	212	183
Dolomite	NA	254	225	168	171
Gypsum	7	7	5	6	11
Lime, hydraulic	2	2	1	1	--
Limestone	NA	36	27	51	30
Molding sand	30	40	40	22	28
Quartzite thousand cubic meters	NA	24	27	36	27
Sand and gravel do	543	542	647	467	380
Stone:					
Cut stone:					
Crude thousand cubic meters	2	1	1	1	NA
Flagstone thousand square meters	2	3	4	NA	NA
Building stone:					
Rough cut thousand cubic meters	49	49	48	30	NA
Facing thousand square meters	7	5	9	NA	NA
Crushed rock thousand cubic meters	367	468	441	162	NA
Paving blocks thousand pieces	42	70	50	44	NA
Fertilizers and raw materials:					
Basic slag	767	818	837	777	NA
Manufactured phosphate fertilizers (P_2O_5 content) [2]	127	125	e 127	e 127	NA
Mineral fuels:					
Coke, gas plant	36	28	13	e 10	NA
Manufactured gas thousand cubic meters	24,168	24,031	26,272	NA	NA

e Estimate. NA Not available.
[1] Official figures, includes some remelted pig iron.
[2] For fiscal years ending June 30 of year stated.

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COMMODITY REVIEW

Metals.—*Iron and Steel.*—Steel production in 1967 was 2 percent higher than in 1966. However, steel prices continued to decline and profits of the steel industry, employing 47 percent of all wage earners in Luxembourg, probably remained stable.

ARBED (Acieries Reunies de Burbach-Eich-Dudelange, Société Anonime, Luxembourg) was the largest iron and steel producer in the country during 1966. During 1967 efforts were concentrated on making the steel industry more competitive in the world market. The first step of the restructuring was the takeover by ARBED of Hadir, formerly Luxembourg's second largest producer. Merger was finally concluded in July 1967, giving the new company a 90 percent share of Luxembourg's steel output. The new corporation with production capacities of 5 million tons, is considered of optimal size for a steelmaking firm.

In 1967 a number of new investments were completed which had been started 3 or 4 years earlier, notably the two 125-ton capacity oxygen converters, in Esch-Belval, at a cost of $26 million. No major investment projects are expected in Luxembourg in the immediate future because of the concern as to the future competitiveness of inland mills. Considering this fact ARBED invested up to 48.14 percent of the total in the modern "SIDMAR" steel mill on the Belgian coast.

Other Minerals.—Domestic production of minerals, mostly nonmetallics was small and of no significance.

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The Mineral Industry of Bolivia

By Robert A. Whitman [1]

Bolivian nonfuel mineral production decreased in 1967 while production of mineral fuels (crude oil and natural gas) increased two and one-half times over the 1966 level. Output of metallic minerals was higher than that of 1966 but was overbalanced by decreases in nonmetal output. The sharp increase in crude oil production was made possible because the construction of a new pipeline provided an export outlet for oil from wells which had been shut in at the Caranda-Colpa field.

The mineral industry, excluding petroleum, contributed about 9 percent to the gross domestic product. Mineral exports, including petroleum, accounted for almost 90 percent of total commodity exports. Tin represented over two-thirds of the value of nonfuel mineral exports and provided over half of all export earnings.

The tin industry was plagued by serious strikes at two of the largest mines in June 1967 and by a decrease in both the demand for and price of tin in the world market. COMIBOL, the semiautonomous government agency operating the expropriated tin mines, can hardly make an appreciable profit until allowed to rationalize employment and divorce management from politics. To stabilize employment, it is important that COMIBOL be permitted to implement the planned reorganization for which legislation was passed. Mining of vein-type deposits and high-cost transport make tin production in Bolivia an expensive operation, although there appears to be opportunities for improvement.

A law passed by the Senate and Chamber of Deputies of Bolivia in December 1966 gave specific approval to COMIBOL to enter into joint ventures with private capital. However, requirements that a COMIBOL representative be president of the resulting company and have executive powers, and the cancellation of any right of the private partner to appeal to international courts of justice, are not encouraging to private capital.

At the beginning of 1967, Bolivia had sizable obligations in the form of loans from Operation Triangular, the three-member consortium composed of the U.S. Agency for International Development (AID), the Inter-American Development Bank (IDB), and the Federal Republic of Germany, formed in 1961 to assist COMIBOL to financial stability. These obligations amounted to $47,306,975[2] with total interest charges of $10,998,150. COMIBOL had paid $8,180,169 on the principal and $5,634,279 in interest by January 1967.

The Mining Bank (BAMIN), by not instituting sorely needed commercial and internal administrative reforms, incurred losses of nearly $2.4 million from January through September 1967. AID had disbursed $450,000 for loans to the Small Mines group and $300,000 for the retirement of about 150 BAMIN employees, but withheld further disbursements pending additional changes and reforms. BAMIN reportedly has raised the service fee to the Small Mines group for handling concentrates and has contracted with a broker in England to develop a commercial "hedging" operation.

The Bolivian Constitution of 1967, promulgated February 3, 1967, did not change the official attitude toward the mineral industry as set forth in the 1961 Constitution. Articles 136 through 140 extend the domain of the State to include "the soil and subsoil"; further declare that no groups of nationalized mines are to be sold or transferred

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[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from the peso (B$) at the rate of B$11.875= US$..

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as property to private enterprise by means of any title; specify all deposits of hydrocarbons, in whatever form or state, to be the "direct public property, inalienable, of the State"; and reaffirm the principle that vests in the State the promotion and development of nuclear energy.

Supreme Decree No. 07447, effective January 7, 1966, established new and simpler export taxes based upon the official price quotations. For example, new export duties on tin ranged from no tax at a price of $1.10 per pound to $0.532 at a price of $2.50 per pound of tin.

PRODUCTION

Production of virtually all metals increased moderately in 1967 with the exception of gold and silver. Nonmetallic output fared less well although sulfur remained at the high level established in 1966. Extraction of crude oil and natural gas increased sharply but the output of petroleum products from domestic refining increased only moderately.

Table 1.—Bolivia: Approximate production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals: [1]					
Antimony, content of—					
Ore and concentrate	7,549	9,620	9,622	r 10,640	11,268
Metal [2]	-------	38	6	27	8
Beryl [2]	-------	30	-------	-------	-------
Bismuth, content of ore and concentrate kilograms	254,410	271,870	r 271,605	r 449,317	502,224
Cadmium, content of ore and concentrate [2] do	-------	-------	5,740	2,400	NA
Columbite-tantalite ore [2] do	-------	-------	-------	4,000	NA
Copper, content of ore and concentrate	r 3,001	r 4,734	r 4,736	r 5,827	6,087
Gold troy ounces	153,019	128,576	94,314	86,982	55,069
Lead, content of—					
Ore and concentrate	19,041	16,493	r 16,313	r 19,490	19,736
Refined metal and solder	254	461	936	r 1,130	237
Mercury 76-pound flasks	[3] 105	[3] 32	52	4	[3] 100
Silver, content of ore and concentrate thousand troy ounces	4,443	4,517	r 3,987	r 4,919	4,515
Tin, content of—					
Concentrate long tons	22,209	24,319	23,036	r 25,626	26,890
Refined metal, solder, dross [4] do	2,462	3,610	3,415	1,062	800
Tungsten concentrate, 60 percent WO_3 equivalent	2,194	2,006	1,820	2,633	3,337
Zinc, content of concentrate	4,229	9,592	r 13,607	r 16,008	16,754
Nonmetals:					
Asbestos	r [2] 11	[3] 139	[3] 178	26	[2] 4
Cement thousand tons	62	64	60	60	62
Fluorite [2]	-------	9	-------	-------	-------
Gypsum [2]	200	700	475	r 1,960	1,100
Salt [2]	350	3,563	r 13,825	r 11,223	4,445
Sulfur	[2] 9,950	[2] 10,806	[2] 9,455	57,461	50,308
Mineral fuels:					
Natural gas million cubic feet	[5] 3,853	[5] 4,145	r 8,103	r 12,033	30,465
Natural gasoline barrels	25,160	64,321	54,605	68,861	65,661
Petroleum:					
Crude thousand 42-gallon barrels	3,404	3,290	3,357	6,085	14,527
Refinery products:					
Motor gasoline do	1,009	1,116	1,182	1,352	1,507
Kerosine do	404	467	512	571	653
Distillate fuel oil do	424	506	596	r 615	751
Residual fuel oil do	594	790	819	r 863	792
Other do	205	13	r 65	r 16	33
Total do	2,636	2,892	r 3,174	r 3,417	3,736

p Preliminary. r Revised. NA Not available.
[1] COMIBOL production plus exports by small and medium mines and smelters unless otherwise noted.
[2] Exports by small and medium mines.
[3] Purchases by Banco Minero.
[4] Contains unspecified amount of tin reported also in tin-in-concentrates production.
[5] Commercial production, processed for domestic fuel and for export.

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TRADE

In 1967, Bolivia had a favorable trade balance for the second consecutive year. This was due partly to a decrease in imports and partly to a fivefold increase in exports of crude petroleum. The value of nonfuel minerals exported was nearly $900,000 less than that of 1966. A loss of $2.5 million in tin export and $1.5 million in lead export values resulted from their lower price on the world market. Metallic minerals continued to dominate the export trade in 1967. Bolivia exported five times as much crude petroleum as in 1966 but exports of natural gas dropped 42 percent to 303 million cubic feet in 1967. The increased export of petroleum and the expansion of COMIBOL and the private mining companies into metals and minerals other than tin will help reduce the country's dependence upon tin as an export for earning foreign exchange.

The relation of mineral trade to total trade for 1965 and 1966 was as follows:

	Value (million dollars)		Mineral commodities share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	125	132	94.7
1966	132	150	88.0
Imports:			
1965	18	134	13.4
1966	17	138	12.3
Trade balance:			
1965	+107	−2	XX
1966	+115	+12	XX

XX Not applicable.

Table 2.—Bolivia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Antimony, content of ore, concentrate, impure bars.	8,766	10,667	Mainly to United States.
Bismuth, content of concentrate	297	373	Peru 271; United States 88.
Cadmium, content of concentrate	6	2	All to United States.
Columbite-tantalite ore	-------	4	Do.
Copper, content of concentrate	4,731	5,702	United States 2,834; Japan 2,078.
Gold, troy ounces	r 84,910	16,236	United Kingdom 15,690; United States 289.
Lead, content of—			
Concentrate	r 15,873	19,431	United States 15,956; Netherlands 2,306.
Refined bars, solder, slag	1,664	1,831	United States 1,379; United Kingdom 200.
Total	17,537	21,262	
Mercury, 76-pound flasks	r 59	-------	
Silver, thousand troy ounces, content of concentrate.	r 4,114	5,124	United States 4,076; Netherlands 447.
Tin, content of—			
Concentrate, long tons	r 20,422	24,760	United Kingdom 18,438; United States 4,531.
Refined bars, solder, do. dross.	3,406	1,062	United States 1,001; United Kingdom 41.
Total, do.	23,828	25,822	United Kingdom 18,479; United States 5,532.
Tungsten, content of concentrate, 60 percent WO_3 equivalent.	1,853	2,633	United States 2,557; West Germany 76.
Zinc, content of concentrate	13,688	16,702	United States 14,184; Japan 1,540.
Nonmetals:			
Asbestos	7	2	All to United States.
Gypsum	475	1,960	All to Brazil.
Salt	r 17,020	13,151	Mainly to Brazil.
Sulfur	9,455	58,457	Chile 45,721; United States 11,940.
Mineral fuels:			
Natural gas, million cubic feet	630	519	All to Argentina.
Petroleum:			
Crude, thousand 42-gallon barrels	r 266	2,027	United States 1,546; Argentina 481.
Refinery products:			
Distillate fuel oil, do.	r 177	146	NA.
Gasoline, do.	-------	38	All to United States.

r Revised. NA Not available.

Source: Ministerio de Hacienda, Dirección General de Estadística y Censos. Boletín Estadístico, 1966. No. 92.

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Table 3.—Bolivia: Selected imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965		1966	
	Quantity	Value	Quantity	Value
Metals:				
Aluminum, all forms	654	$504,240	973	$727,479
Copper, all forms	404	471,007	367	499,470
Iron and steel, all forms	64,253	14,829,032	44,820	12,034,195
Lead, all forms	19	15,270	15	12,605
Tin, alloys long tons	2	7,681	6	23,542
Zinc, all forms	25	10,292	87	38,044
Metallurgical minerals, slags, ashes	75	14,920	22	2,749
Other nonferrous metals	r 2	r 5,120	11	16,794
Nonmetals:				
Fertilizer, all types	r 3,694	399,032	3,861	388,643
Other [1]	10,916	531,237	15,322	722,269
Mineral fuels:				
Coal and coke	773	58,343	797	55,182
Petroleum refinery products:				
Aviation gasoline	10,737	761,151	14,633	923,115
Motor gasoline	44	5,027	31	4,217
Kerosine	90	13,887	83	10,331
Diesel oil	512	r 56,662	22	2,330
Fuel oil	214	14,010	188	14,043
Other	6,144	796,366	10,941	1,197,320
Total	18,514	r 1,705,446	26,695	2,206,538

r Revised.
[1] Salt, sulfur, gypsum, lime, cement, earths, and stone not separately identified.

COMMODITY REVIEW

METALS

Iron Ore.—The Cerro de Mutún, located on the Brazilian border, contains about 40 billion tons of iron ore, with an additional one-half billion tons of float ore. While the Mutún deposit ranks in size with the world's largest, it is a hematite ore high in silica and phosphorus, 1,600 kilometers from the nearest port or industrial center, and probably will not attract any development capital for several years.

Selenium.—A selenium mineral, penroseite, was found in four claims in Chayante Province, about 85 kilometers northwest of Sucre. The selenium mineralization is vein type and reportedly occurs with siderite, hematite, calcite, and sulfides of lead and copper. There has not been enough work to date to determine grade or reserves.

Tin.—The Bolivian Government, by Decree Law 7965 of July 15, 1966, set up Empresa Nacional de Fundiciones (ENAF) to smelt tin, and operate the BAMIN Metabol smelter. It was intended that ENAF smelt concentrates purchased from the small and medium miner; however, by the beginning of 1967, ENAF had expended most of its capital and could no longer afford to pay cash for concentrates. By December 1, 1967, it had leased the smelter to COMIBOL for experimental volatilization trials. The volatilization process being tested may make possible the recovery of tin from low-grade material. COMIBOL plans to use the smelter for 2 years to carry out industrial-scale trials under the direction of the Instituto de Investigaciones Minero-Metalúrgico (Institute of Mining and Metallurgy Research).

During 1966 representatives of ENAF contracted with Klöckner Industrie Anlagen (Klöckner) for construction of a new smelter of 20,000 tons fine tin annual output capacity at Oruro.

A meeting of a Commission of the Bolivian Government to advise on the Klöckner contract in May 1967 found that the original smelter design was based on the grade of tin concentrates produced in 1963, and that lower grade concentrates, along with increasing iron and arsenic impurities, made process changes necessary. It was decided, with Klöckner's concurrence, that the furnaces be changed from rotary

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to reverberatory and the plant was redesigned to enable it to treat medium-grade tin concentrates. Many other problems, such as supply of specification-grade limestone, charcoal, and pyrites, have not been resolved.

An evaluation of the metallurgical operations at the various COMIBOL properties was made by a consultant for the IDB during January and February 1967. The report concluded that there were some mills which needed replacing completely and most of the others were in poor mechanical condition. It contrasted the use of modern techniques of heavy media separation with the use of wheelbarrows to handle the resulting concentrates. The metallurgical staff reportedly had adequate academic preparation. In general, the conclusions were optimistic for COMIBOL, if it could be allowed to develop without hindrance.

The reduction of excess COMIBOL employees, begun in 1965, was reversed in 1966. As of January 1, 1967 COMIBOL had 23,476 on the rolls. In April, COMIBOL closed the San José mine because of heavy losses from theft, low productivity, and labor anarchy. About 30 percent of the employees were released with the remaining 1,370 persons retained on the payroll. In August the mine was reopened partly to placate the unions for the closing of the Metabol smelter by ENAF. Although by the end of 1967 COMIBOL had reduced employment to about 22,500, the bonus pay increase granted at the beginning of the year resulted in an increase in total labor cost. Adding to the overall labor problem, the company suffered strikes at Huanuni and Catavi in midyear that necessitated intervention of the armed forces.

The president of COMIBOL, Col. Juan Lechín, announced in December that COMIBOL would stop buying mineral concentrates because this pratice competed with BAMIN, which normally buys and sells these minerals.

The International Metals Processing Corp. (IMPC), Dallas, Tex., was granted a contract to construct a concentrating plant capable of handling 1,000 tons per day of dump material averaging 0.4 to 0.5 percent tin. In addition to the 7 million tons in the Kenko tailings pile at Catavi which IMPC has a contract to process, COMIBOL has given them the right to work the present Catavi tailings dumps, the Huanuni "sand tails" dumps, as well as those of the Unificada and several other mines. IMPC has auhorized COMIBOL to use its patented tin-concentrating method free after the IMPC mill at Catavi has been in operation for 1 year.

Empresa Minera Unificada, S.A. (EMUSA), the medium mining company which is the largest producer of anitmony, purchased about one-third of the huge low-grade Rodeo glacial moraine tin deposit for about $160,000. EMUSA needs about $300,000 to determine volume, grade, and eventual profitability of the deposit.

At the end of July, Estaños Aluviales, S.A. (ESTALSA), a consortium of W.R. Grace & Co., United States Steel Corp., Lockheed Aircraft Corp., and the Chase Manhattan Bank, began dredging operations with a company-built dredge at Avicaya, about 50 kilometers south of Oruro. The 10,000-cubic-yard-per-day dredge is operating on a placer deposit of about 200,000 hectares averaging about 0.7 pounds of tin per cubic yard. ESTALSA later reportedly bought an additional 60,000 hectares.

At its Kelluani tin mine, about 30 kilometers north of La Paz, Trans-American Resources, Inc. (TAR), a subsidiary of Shattuck Denn Mining Corp., has a 70-ton-per-day plant which produces concentrates containing the equivalent of about 5 tons per month of fine tin. The company claims an enormous reserve potential of low-grade (approximately 0.6 percent) tin ore for which they seek a partner with about $2 million to build a 2,000-metric-ton-per-day concentrating plant.

Zinc.—In January, the Bolivian Senate and Chamber of Deputies passed a law legalizing the contract between the Bolivian Government and the Mina Matilde Corp. for the operation of the Matilde mine, about 105 kilometers (airline) northwest of La Paz and about 10 kilometers inland from the shores of Lake Titicaca. Development work is said to have blocked out 3 million tons of ore averaging 18.8 percent zinc, 1.8 percent lead, and 1.5 ounces of silver per ton. The Matilde Corp. is a partnership formed by United States Steel Corp.andPhillip Brothers Corp. Wright Engineers, a Canadian firm, was

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Table 4.—Bolivia: Exports of tin by groups

(Long tons of contained tin)

Group	1965	1966	1967
Tin contained in concentrates:			
Corporación Minera de Bolivia	13,673	17,263	18,026
Medium-size mines	3,862	4,562	5,258
Medium mines-Banco Minero	------	----------	50
Banco Minero	2,887	2,935	3,234
Others	--------	----------	20
Smelter products (refined metal and solder): ENAF and Fundición de Estaño de Oruro	3,406	1,062	1,018
Total	23,828	25,822	27,606

awarded the contract for construction of the concentrating plant, housing, and other plant buildings.

Yugoslavia is to send a metallurgical mission to Bolivia to study the feasibility of a zinc refinery.

NONMETALS

Sulfur.—Exports from Bolivia remained above 50,000 metric tons in 1967. Nearly all of this was produced by the Sociedad Minera de Lípez (SOLMIN), a Bolivian company owned by a group of sulfur mine owners in southwestern Bolivia. SOLMIN leased the San Pablo de Napa deposit from the Caja de Pensiónes y Jubilaciónes Militares (CPJM) in November 1965, and also control the Concepción and Desierto deposits nearby. The San Pablo deposit reportedly contains about 7 million metric tons of about 70 percent sulfur ore, and is one of the largest known deposits in a belt of volcanic sulfur occurrences located along the Chilean border. SOLMIN reportedly is operating five autoclaves. The high costs of mining, refining, and transportation are increased by the lack of water, which must be trucked from Chile, making production from this area feasible only when the price of sulfur is high.

MINERAL FUELS

Natural Gas and Petroleum.—Production of both natural gas and crude petroleum for 1967 was two and one-half times the production for 1966. The increase was all from the Caranda and Colpa fields of Bolivian Gulf Oil Co. (BOGOC). Production of natural gas by Yacimientos Petrolíferos Fiscales Bolivianos (YPFB) and Bolivian Oil Co. (BOC) declined 2 percent and 42 percent, respectively, whereas output of crude petroleum by YPFB declined 14 percent and that for BOC 44 percent. While some natural gas is exported to Argentina, disposal of the remaining output was unreported. Considerable quantities apparently were used in the fields for fuel and for injection into reservoirs to maintain pressure.

The two companies active in drilling, YPFB and BOGOC, increased the total footage drilled by around 25 percent over 1966 to 277,190 feet. This was divided between 19 exploratory holes, 6 bringing in crude oil, 2 with gas, and 11 dry holes, and 22 development wells, 18 with oil, 3 with gas, and 1 dry hole.

Bolivian Gulf Oil Co. increased its exports of crude oil, mostly to the United States, from 1,545,649 barrels in 1966 to 9,169,892 barrels in 1967. This increase resulted from the fact that 1967 was the first full year of use of the newly constructed 10-inch to 12-inch pipeline extending 685 kilometers from the pumping station at Santa Cruz to Sica Sica on the Altiplano. This line is connected to the 8-year-old pipeline to Arica, Chile, built for YPFB but never used for lack of sufficient production. Opening of the line allowed BOGOC to quadruple production from its Caranda and Colpa fields north of Santa Cruz. In order to further increase exports from Arica appreciably, BOGOC will need additional pumping capacity for the pipeline and additional storage capacity to supplement 300,000-barrel storage presently at Arica. Permission for building at Arica probably will not be granted until diplomatic relations between Bolivia and Chile are restored. The company inaugurated a $1 million gas injection plant with a capacity of 34 million cubic feet per day at Caranda.

At the beginning of 1967, BOGOC had 135 regular employees and about 440 con-

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tract employees. The company had reserves of 200 million barrels of crude oil and 2 to 3 trillion cubic feet of gas. These represented about 94 percent of the measured oil reserves and 80 percent of the estimated gas reserves for Bolivia, although BOGOC has only 1,747,803 hectares (3.54 percent) of the potential oil land allotted for exploration.

In May, BOGOC announced that it would begin drilling new exploration wells in Cochabamba Department about 105 kilometers east-northeast of the city of Cochabamba and 19 kilometers from Villa Tunari.

Most of the drilling done by YPFB probably was for development of the promising new Monteagudo field northwest of Camiri. However, Monteagudo No. 7 well blew out on December 1 at 4,888 feet and had not been brought under control by the end of the year. It reportedly was losing 100 million cubic feet of gas per day and undetermined quantities of crude oil. Unless brought under control soon, this loss of gas could greatly slow up development of the field or, under extreme conditions, make further development impractical. Production by YPFB which holds 11,245,208 hectares of potential oil lands, has been decreasing for the last 3 years, and this was the first promising field discovered since the company was nationalized. YPFB produced less than half of the crude oil it exported and processed during 1967, obtaining the rest from BOGOC. Its refineries operated at about 72 percent of rated capacity. The company employs about 4,000 workers in an operation which includes 5 refineries and about 10 drilling rigs.

In April, YPFB announced a new oil and gas discovery at the Sierra de Candado field, 28 kilometers from Bermejo on the Argentine border. The discovery well was down 3,800 feet, and its production was 110 barrels per day of 24° API oil with possible gas production of 70,000 cubic feet per day. The crude oil from this field will probably be sent to Argentina through the Bermejo-Oran (Argentina) pipeline.

In May, YPFB purchased a 10-million-cubic-foot-per-day gas liquefying plant. The plant, to be erected in Camiri sometime in 1968, will produce about 29,000 gallons of natural gas liquids per day. Seventy percent of its output will be liquefied petroleum gas.

The Director of the Gas and Petrochemical Division of YPFB has reported the conclusion of engineering studies for the construction of a new refinery and catalytic reformer plant in Santa Cruz to produce high-octane gasoline, benzene, toluene, and other derivatives basic to future production of certain petrochemicals. The engineering feasibility studies were carried out by Universal Oil Products and Hydrocarbon Research, Inc., of the United States. The plant reportedly will be financed and built by a Japanese concern. Although Bolivia has a very small domestic market and would be subject to high transportation costs in exporting these products, the possible profits from such a venture, for which financing is not yet firmly committed, are causing much excitement.

YPFB and BOGOC negotiated an agreement to enter into joint development of a region on the Altiplano from 35 to 40 kilometers wide extending from near Lake Titicaca southeast to Oruro. Bolivian Gulf is to spend approximately $30 million on the development program, in which YPFB will have no active part. If oil is discovered, YPFB will pay its share of the development costs out of its share of the oil produced.

YPFB and BOGOC have signed another letter of intent to form a joint company to build a 26-inch gas pipeline to tie into Argentina's 1,700-kilometer gas line from Campo Duran to Buenos Aires. This latter line is already carrying 80 percent of its capacity, and at yearend the Argentine Yacimientos Petrolíferos Fiscales (YPF) had not agreed to a contract.

The third operating company, Bolivian Oil Co., exported 303 million cubic feet of gas to Argentina from the Madrejones field near Yacuiba which they own jointly with YPFB. This was 41 percent less than that of 1966. Their export of 7,764 barrels of crude oil to Argentina was 43 percent less than that of 1966. Output from the Madrejones field has been declining for several years.

Supreme Decree No. 8093, September 12, 1967, established the Bolivian Gas and Petrochemical Co. (GPB) as a new entity to be responsible for all phases of the exploitation of natural gas. However, two amending decrees substitute YPFB as the Government organization to carry out the handling of natural gas, and establish a "National Petroleum and Petrochemical

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Council", headed by President Barrientos, which is to supervise, plan, and regulate the exploitation of hydrocarbons both by YPFB and private companies. These decrees should put the Government firmly in control of planning for a future petrochemical industry.

Table 5.—Bolivia: Crude petroleum production by company and field

(Thousand 42-gallon barrels)

Company and field	1966	1967
Yacimientos Petrolíferos Fiscales Bolivianos:		
Camiri-Guairuy-Tataranda-Buena Vista	2,858	2,469
Sanandita-Camatindi	49	47
Bermejo-Toro	266	221
Total	3,173	2,737
Bolivian Oil Co.: Madrejones	27	15
Bolivian Gulf Oil Co.: Caranda-Colpa	2,885	11,775
Grand total	6,085	14,527

Table 6.—Bolivia: Consumption [1] of petroleum refinery products

(Thousand 42-gallon barrels)

Product	1966	1967
Aviation gasoline	125	[2] 112
Motor gasoline	1,254	1,358
Kerosine	551	590
Gas oil	71	NA
Diesel oil	459	369
Fuel oil	749	724
Lubricants	NA	33
Naphtha	91	NA
Other products	NA	3
Total	3,300	3,077

NA Not available.

[1] Figures refer to actual civilian and military consumption through sales to consumer, and including YPFB consumption.

[2] Imports.

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The Mineral Industry of Brazil

By Gordon W. Koelling [1] and F. William Wessel [2]

In 1967, Brazil's mineral industry experienced a second consecutive year of high-level activity. Generally production of mineral commodities was strong; exports, which had declined in 1966 principally because of a slump in world demand for iron and steel, regained their lost ground in 1967. Two companies owning iron ore properties merged to form a more active company. A third aluminum company, organized in 1965, was approaching the production stage. The largest iron ore producer concluded additional contracts for the sale of its ore to Japan. A large copper ore body was outlined in Bahia, and new iron deposits were discovered in the Amazon Basin. Attempts to revive tungsten mining in the Northeast began to show progress. Two zinc smelters encountered technical difficulties but progressed toward initial production. Rising crude oil output supplied 38 percent of Brazil's requirements in 1967 (32 percent in 1966). Production of columbium and tin ores and cement continued strong; salt and chromite production was weak.

By Decree-Law 227, of February 28, 1967, amended in part by Decree-Laws 318 and 330, a new Brazilian Mining Code was instituted. Basically, all mineral deposits are considered to be the property of the nation. General geological reconnaissance is not limited, but thereafter a permit to prospect must be obtained from the Government. Prospecting, in Brazilian terms, is understood as the detailed examination of a limited area for specific minerals. The owner of the surface no longer has priority in obtaining the right to mine under his land. If at any time the holder of the right to prospect, develop, and produce fails to proceed with reasonable diligence through the various stages of developing a prospect into a mine, his tenure is revoked, and the rights revert to the Government. The requirements for legal mining activity were not made retroactive. Liquid fuels, natural gas, and mineral materials related to the production of nuclear energy are specifically exempted from the provisions of the Code.

PRODUCTION

Production of most mineral commodities in 1967 was maintained at about the same high level attained in 1966. A few commodities, particularly the fuels, registered sharp gains, continuing a general upward trend. Production of ferrocolumbium increased 15 percent, scheelite concentrates an estimated 47 percent, tungsten metal 23 percent, bituminous coal (run-of-mine) 18 percent, natural gas 11 percent, and crude petroleum 26 percent. Production of graphite more than doubled.

The production of beryl declined steadily from 1960 to 1966, but increased by 65 percent in 1967.

Tabulated chromite figures represent shipping-grade material from Bahia only. There is minor production in Minas Gerais and Goiás, but shipment data are not available. Official production data reported are not used because they represent crude ore and grade is not specified. It can be determined, however, that Brazil's chromite production declined at least 40 percent in 1967.

Production of salt declined 21 percent in 1967. Almost all salt in Brazil is produced by solar evaporation, about two-thirds of it in Rio Grande do Norte. Production costs are high and increasing because of inefficient producing and handling methods and a long haul to market.

[1] Geographer, Division of International Activities.
[2] Physical scientist, Division of International Activities.

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Table 1.—Brazil: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity [2]	1963	1964	1965	1966	1967 p
Metals:					
Aluminum:					
Bauxite	169,636	131,650	155,968	r 239,931	e 261,000
Alumina	42,698	50,921	55,355	68,254	e 74,000
Metal, unwrought	17,610	26,640	r 30,407	r 26,886	e 36,000
Semimanufactures	20,471	2,734	25,451	e 41,400	e 48,000
Arsenic, white	293	188	256	r 317	222
Beryl	3 1,969	3 1,421	3 1,113	4 796	3 1,310
Chromite [5]	17,053	9,440	16,960	14,964	6,865
Columbium and tantalum:					
Pyrochlore concentrate	-------	323	1,196	4,775	4,626
Columbite-tantalite concentrates:					
Columbite [6]	r 19	3 11	3 40	3 r 59	83
Tantalite [6]	r 105	3 82	3 165	3 r 160	225
Ferrocolumbium	-------	18	276	459	528
Copper:					
Ore:					
Gross tonnage	84,760	110,631	126,227	r 119,529	e 120,000
Copper content e	1,500	2,000	r 2,200	r 2,150	2,200
Refined metal e	2,000	3,000	3,000	3,000	3,000
Gold bullion [7]—thousand troy ounces	132	r 143	r 155	r 168	172
Iron and steel:					
Iron ore—thousand tons	11,219	16,962	18,160	r 23,254	23,500
Pig iron—do	r 2,516	r 2,664	r 2,399	2,937	3,100
Cast iron—do	342	334	NA	NA	NA
Ferroalloys [8]—do	47	42	51	NA	NA
Ingot steel—do	2,824	3,016	2,983	3,767	3,720
Cast steel—do	41	40	41	e 50	50
Rolled steel—do	2,321	2,422	2,161	2,886	2,853
Lead:					
Ore:					
Gross tonnage	240,282	236,144	266,919	r 267,404	277,938
Lead content e	17,400	14,700	r 22,500	r 22,637	23,422
Metal, primary, smelter	r 15,993	r 13,079	9,665	r 17,177	17,234
Manganese ore [9]—thousand tons	1,254	1,352	1,396	1,239	1,145
Nickel:					
Ore, garnierite	52,997	54,494	59,311	r 59,711	e 69,100
Nickel content of ferronickel	1,030	e 1,000	1,114	r 1,384	1,071
Rare-earth metals and compounds:					
Monazite	2,221	665	597	746	1,079
Rare-earth salts	3 865	3 899	3 4,329	1,977	1,653
Metals and alloys [3]—kilograms	e 1,500	e 2,500	e 3,000	14,756	14,034
Silver bullion—thousand troy ounces	281	r 314	r 228	r 222	e 225
Tin:					
Cassiterite concentrates:					
Gross tonnage—long tons	1,922	1,215	2,788	r 2,460	e 2,500
Tin content e—do	1,150	790	1,810	r 1,855	1,600
Metal, smelter—do	2,051	1,731	1,753	r 1,545	1,415
Titanium ores:					
Ilmenite [10]	5,882	8,271	9,794	13,535	14,967
Rutile	389	286	360	r 34	7
Tungsten concentrate, scheelite:					
Gross tonnage	463	319	318	3 340	e 500
60 percent WO_3 equivalent	555	383	382	e 400	e 600
Metal—kilograms	NA	NA	2,726	3,811	4,671
Zinc:					
Ore and concentrate	-------	---------	r 5,250	3 324	NA
Metal	-------	---------	e 75	r 1,344	NA
Zirconium:					
Zircon	962	1,756	1,156	10 1,954	2,162
Baddeleyite-caldasite	325	516	493	e 495	e 500
Nonmetals:					
Agate, rough [3]	219	338	446	596	471
Asbestos minerals [5]	1,306	1,300	1,092	1,651	1,264
Barite	34,111	33,537	64,360	5 40,228	5 54,497
Cement:					
Portland, common—thousand tons	5,154	5,530	5,545	r 6,012	6,369
Portland, white—do	30	34	32	34	36
Total—do	5,184	5,564	5,577	6,046	6,405
Corundum and emery, natural [3]	1	4	2	NA	2
Diamond:					
Gem e—carats	175,000	175,000	175,000	150,000	160,000
Industrial e—do	175,000	175,000	175,000	150,000	160,000
Dolomite	477,805	330,387	223,209	r 200,530	NA
Gem stones [3 11]	418	703	762	710	610

See footnotes at end of table.

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Table 1.—Brazil: Production of mineral commodities [1] —Continued

(Metric tons unless otherwise specified)

Commodity [2]	1963	1964	1965	1966	1967 [p]
Nonmetals—Continued					
Graphite	[e] 1,500	[e] 1,150	1,172	[r] 1,277	2,896
Gypsum	105,620	84,405	72,538	[r] 80,223	NA
Lime thousand tons	1,208	1,438	1,220	[r] 1,269	NA
Lithium ores: Spodumene [3]	25	----	6,815	[e] 100	[e] 50
Magnesite	90,298	93,740	124,642	[r] 127,071	NA
Marble, dimension stone	53,011	50,952	46,500	[r] 41,228	NA
Mica, muscovite	1,492	[3] 1,741	[3] 2,263	[r] 1,018	[e] 1,041
Nitrogenous fertilizers, manufactured:					
Ammonia [12]	20,310	14,452	27,283	17,954	26,011
Ammonium nitrate	3,667	5,085	6,538	7,838	8,860
Ammonium sulfate	9,570	9,742	11,295	10,502	9,891
Calcium nitrate	56,272	26,466	57,687	16,785	36,818
Nitric acid [12]	56,249	35,566	77,513	47,931	78,244
Phosphate fertilizers, natural:					
Ores and concentrates, as reported:					
Apatite	215,288	195,077	191,836	[r] 295,215	NA
Phosphate rock	63,506	51,142	86,908	[r] 83,150	[e] 80,000
Total	278,794	246,219	278,744	[r] 378,365	NA
Marketable concentrates [13]	146,754	149,355	137,140	NA	NA
Quartz crystal [3]	1,246	1,685	2,119	[r] 3,254	3,407
Salt thousand tons	1,193	754	1,200	1,313	1,040
Sulfur, elemental	5,750	NA	5,022	5,918	6,210
Talc, soapstone, pyrophyllite	34,915	48,115	57,648	[e] 58,000	NA
Vermiculite	NA	NA	NA	400	218
Mineral fuels:					
Carbon black	24,850	23,904	22,580	29,446	30,700
Coal, bituminous (run-of-mine) thousand tons	2,571	3,246	3,383	[r] 3,666	[r] 4,339
Coke:					
High-temperature do	858	912	[r] 909	[r] 1,240	1,310
Gas-house do	[e] 285	[e] 280	219	224	205
Manufactured gas million cubic feet	NA	NA	[r] 12,633	12,828	13,118
Natural gas (gross withdrawal) do	[r] 20,051	[r] 18,777	[r] 24,125	[r] 27,844	30,888
Natural gas liquids thousand 42-gallon barrels	564	832	945	[r] 788	756
Petroleum:					
Crude oil do	35,714	33,310	34,342	42,446	53,515
Refinery products:					
Motor gasoline do	32,799	36,536	36,555	42,461	43,019
Jet fuel do	----	6	----	145	1,266
Kerosine do	4,053	[r] 4,540	4,123	4,635	4,762
Distillate fuel oil do	22,324	23,910	22,984	28,996	[e] 31,000
Residual fuel oil do	41,094	39,290	35,314	38,886	[e] 40,000
Lubricants do	52	3	35	----	----
Asphalt do	1,596	1,288	1,817	2,467	11,232
Solvents do	748	795	735	902	
Liquefied petroleum gases do	4,113	5,417	6,593	[r] 7,230	
Other do	725	507	484	[r] 849	
Total do	107,504	112,292	108,640	126,571	[e] 131,279

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] Includes export data on some commodities for which production data are not available and on commodities for which export data are more representative than incomplete data on production.

[2] In addition to commodities tabulated, Brazil produces antimony, bentonite, various clays, diatomite, feldspar, limestone, ocher, pyrite, glass sand, thorium compounds, and uranium oxide, and various construction materials, but reliable data on quantities are not available.

[3] Exports.

[4] U.S. imports.

[5] Production of State of Bahia only.

[6] Production of columbite and tantalite are not separately reported; total production for 1963 and 1967 allocated on the basis of export ratio for the year.

[7] Officially reported production for Minas Gerais and Paraná for 1963–64. Data for 1965 include unofficially reported output for Minas Gerais, Bahia, and Goiás only. Perhaps as much as 60 percent of total gold recovered in Brazil is not reported statistically.

[8] Does not include ferrocolumbium.

[9] Various grades, including mine-run production of largest producer. This company washes out about 20 percent of its mine product before shipping.

[10] Production of CNEN only.

[11] Includes rough and cut (but unset) stones except diamonds and rough agate.

[12] Includes quantities used in the production of other nitrogen derivatives.

[13] Production of marketable apatite and phosphate rock is not reported separately.

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TRADE

Brazil's overall trade balance in 1967 showed imports exceeding exports by $13.4 million, or 0.8 percent based on total imports. In 1966 there was a favorable trade balance of $245 million. The excess of mineral commodity imports over exports in 1966 was $351.2 million, an increase of 62½ percent over the (revised) 1965 figure of $216.1 million.

Exports of mineral commodities declined 14½ percent in 1966, and accounted for 9½ percent of all exports. The principal component of the decline was the decrease of 55 percent in iron and steel exports; preliminary 1967 figures show a sharp recovery.

Imports of mineral commodities in 1966, up 26½ percent from 1965, accounted for 34½ percent of total imports. Metals accounted for the largest part of the increase, being 66½ percent greater than in 1965; nonmetal imports were up 7 percent, and fuel imports 11 percent. Imports of aluminum and copper increased 102 and 148 percent, respectively; imports of iron and steel and of zinc increased by 44½ and 11 percent respectively. Preliminary 1967 data show sharp declines in imports of aluminum, copper, iron and steel, and coal.

Several changes in tariff levels became effective during 1967. Anthracite coal, lignite, and coke were exempted from import duties. The tariff on raw lead was cut to 10 percent ad valorem, provided the importer proved purchases of domestic lead at a 4:1 ratio. The tariff on raw zinc was increased from 15 to 25 percent late in the year; however, shortly thereafter it was reduced to 10 percent, provided that a quota of 2,580 tons per year of domestic zinc had been sold. (Domestic zinc production is nominal.)

Exports of iron and steel scrap were prohibited unless the scrap first had been unsuccessfully offered to domestic consumers at a comparable price.

Table 2.—Brazil: Value of trade in mineral commodities

(Thousands)

Exports	1965	1966	Imports	1965	1966
Metals:			Metals:		
Beryl, industrial	$322	$203	Aluminum	$11,143	$22,470
Columbium and tantalum [1]	1,861	5,455	Copper	27,552	68,358
Iron ore	102,979	100,200	Iron and steel	47,969	69,262
Iron and steel	44,877	20,281	Zinc	13,870	15,384
Manganese ore	29,219	26,794	Other	15,780	18,223
Other	3,582	2,962	Total	116,314	193,697
Total	182,840	155,895	Nonmetals:		
Nonmetals:			Asbestos	3,500	4,364
Barite	177	390	Caustic soda	10,261	12,186
Diamond, industrial	290	270	Nitrogenous fertilizers	15,672	16,263
Gem stones, including agate	2,152	1,602	Phosphatic fertilizers	6,927	6,849
Mica	1,195	1,743	Potassic fertilizers	8,568	7,051
Quartz crystal	2,583	2,427	Salt	3,583	2,796
Other	1,867	1,422	Sulfur	7,075	7,927
Total	8,264	7,854	Other	6,272	8,856
Mineral fuels	8	3	Total	61,858	66,292
Grand total	191,112	163,752	Mineral fuels:		
			Coal and coke	22,584	31,802
			Crude petroleum	156,441	164,573
			Refined petroleum products	46,220	54,992
			Other	3,750	3,596
			Total	228,995	254,963
			Grand total	407,167	514,952

[1] Excludes ferrocolumbium which is included under iron and steel with other ferroalloys. Exports of ferrocolumbium were valued at $622,001 in 1965 and $1,290,000 in 1966.

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Table 3.—Brazil: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Bauxite	2,200	2,270	Argentina 1,130; Uruguay 1,100.
Oxide	403	15	All to Argentina.
Metal:			
Unwrought	697	842	Do.
Semimanufactures	3	4	Chile 2; Paraguay 2.
Beryl	1,113	706	All to United States.
Chromite	-------	50	All to Peru.
Columbium and tantalum:			
Pyrochlore concentrate [1]	1,259	3,870	United States 2,140; United Kingdom 800.
Columbite—kilograms	40,061	59,244	All to United States.
Tantalite—do	165,322	159,572	Do.
Iron and steel:			
Iron ore—thousand tons	12,731	12,910	United States 3,025; West Germany 2,976; Japan 1,839.
Slag, scrap, and other residues	27,122	24,166	Angola 9,800; Netherlands 7,736; Argentina 6,580.
Pig iron	101,296	2,000	All to Uruguay.
Ferroalloys:			
Ferrochrome	47	38	All to Argentina.
Ferrocolumbium	211	408	All to United States.
Ferromanganese	7,260	776	Mainly to Venezuela.
Ferronickel	1,810	756	France 422; Mexico 174; Argentina 157.
Ferrosilicon	1,051	100	All to Argentina.
Ingot steel	10,597	256	Mainly to France.
Semimanufactures	360,082	143,280	Argentina 62,503; United States 44,681 Uruguay 24,255.
Lead ore and concentrate	12,925	5,000	All to France.
Manganese ores	1,067,763	956,558	United States 618,254; Japan 81,511.
Mercury—76-pound flasks	-------	450	All to Netherlands.
Rare-earth metals:			
Ferrocerium—kilograms	3,000	4,120	All to Argentina.
Cerium chloride	4,312	1,598	Mainly to United States.
Unspecified compounds	17	54	France 36; United States 14.
Tungsten:			
Scheelite concentrate	426	340	West Germany 130; Belgium-Luxembourg 50.
Metal, all forms—kilograms	545	566	Mainly to West Germany.
Zinc ore	522	324	All to Belgium-Luxembourg.
Zircon—kilograms	34,000	25,000	All to Argentina.
Other [2]	214	7,737	Mainly to Netherlands.
Nonmetals:			
Abrasives [3]	786	581	Mainly to Argentina.
Agate, rough—kilograms	446,074	596,470	Japan 233,682; West Germany 178,186; United States 102,966.
Barite	22,087	48,768	Trinidad and Tobago 36,576; Venezuela 12,192.
Cement, portland	2,739	3,689	Mainly to Bolivia.
Clays and clay products:			
China clay	1,405	700	Mainly to Uruguay.
Nonrefractory clay products	128	355	Peru 150; Paraguay 142.
Diamonds:			
Industrial—carats	22,670	22,130	United States 8,280; Argentina 5,900; Netherlands 5,295.
Gem, uncut—do	5,520	9,175	Netherlands 4,490; United States 3,545.
Gem, cut but unset—do	2,395	4,210	United States 3,290; Netherlands 915.
Fluorspar	10	25	Mainly to Uruguay.
Gem stones: [4]			
Rough or uncut—kilograms	304,295	824,021	Japan 158,134; Belgium-Luxembourg 147,563; United Kingdom 144,240; France 105,387.
Cut, unset—do	189	435	France 246; Bolgium-Luxembourg 84.
Other [5]	457,809	245,849	United States 110,076; Belgium-Luxembourg 28,835; West Germany 28,700.
Graphite	5	9	All to Argentina.
Lithium compounds: Spodumene	6,815	100	All to United Kingdom.
Magnesite	12,361	4,653	Hungary 3,000; Argentina 873; France 650.
Mica, muscovite:			
Sheet, block, scrap, or ground	2,263	1,893	Mainly to United States.
Manufactures	6	4	United States 2; Chile 1; Mexico 1.
Quartz crystal:			
Electronic and optical	278	162	Mainly to United States.
Lasca (fusing grade)	1,841	3,092	West Germany 1,013; United States 600; France 406.
Refractory brick and similar products	2,052	1,647	Mainly to Argentina.

See footnotes at end of table.

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Table 3.—Brazil: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals—Continued			
Stone, dimension:			
Natural or roughly worked:			
Granite	8,010	8,433	Italy 2,876; Japan 1,972; West Germany 1,260.
Marble	66	813	All to Argentina.
Worked stone, not further specified	183	138	All to United States.
Talc, industrial	546	501	Mainly to Colombia.
Other [2]	15	35	Mainly to Uruguay.
Mineral fuels:			
Carbon black	-------	18	Argentina 13; Chile 5.
Petroleum refinery 42-gallon barrels products, lubricants.	100	-------	
Pitch coke	3	-------	

[1] Brazil includes pyrochlore under trade classification 2.37.79—Minérios metálicos, n.e. (metalliferous ores, not specified). Starting in 1963 most, if not all, material exported under this category was pyrochlore concentrate. The quantity shown for 1963 was pyrochlore, but those shown for 1964 and 1965 have not been completely verified and might include small amounts of other commodities.
[2] Includes material not identified by commodity in source, and commodities not listed separately in table.
[3] Includes emery, artificial corundum, and diamond and other gem stone dust. Excludes grindstones and industrial diamond.
[4] Excludes diamonds and rough agate.
[5] Probably represents rejected material suitable for tumbling and mineral suites.
Source: Servico de Estatística Economica e Financeira, Coméricio Exterior.

Table 4.—Brazil: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Oxide	1,035	585	Mainly from France.
Metal:			
Unwrought	21,844	39,540	United States 23,265; Canada 8,324.
Semimanufactures	393	1,364	United States 709; West Germany 175.
Antimony:			
Ore	272	295	Mainly from Peru.
Oxide	35	112	Mainly from Belgium-Luxembourg.
Metal, unwrought and wrought	73	237	Czechoslovakia 90; Hong Kong 60; Belgium-Luxembourg 52.
Arsenic:			
White	114	260	France 193; Sweden 62.
Metal	21	7	Mainly from Sweden.
Bismuth metal, all forms kilograms	12,218	9,781	Mexico 7,368; United States 994.
Cadmium, all forms do	33,472	56,576	Mainly from Mexico.
Chromium:			
Chromite	-------	2,037	All from United States.
Oxides	95	225	Poland 87; West Germany 76.
Metal, all forms	4	6	United States 4; Japan 2.
Cobalt:			
Oxides	31	47	United Kingdom 27; Belgium-Luxembourg 19.
Metal, all forms	84	93	Mainly from Belgium-Luxembourg.
Copper:			
Sulfate	2,757	3,165	Mexico 983; United Kingdom 887; United States 547.
Metal:			
Scrap	-------	235	United States 128; Canada 44.
Refined, unalloyed	22,777	43,196	United States 30,382; Chile 5,955.
Alloys, unwrought	13	7	West Germany 4; United States 3.
Semimanufactures, including alloys.	448	494	United States 282; West Germany 191.
Gold:			
Bullion troy ounces	129	32	All from Switzerland.
Semimanufactures do	-------	482	All from United States.
Iron and steel:			
Scrap	72	72	Do.
Sponge, powder, granules	473	914	Mainly from United States.
Ferroalloys	577	2,751	United States 455; Chile 307; Japan 302; Sweden 284.
Semimanufactures	210,997	267,431	Japan 92,258; West Germany 57,841; United States 33,663.

See footnotes at end of table.

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Table 4.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Lead:			
Oxides	36	276	Mainly from Mexico.
Metal, all forms	2,171	5,554	Do.
Magnesium metal, all forms	1,330	2,817	United States 1,558; Norway 1,245.
Manganese:			
Oxides	879	686	Mainly from Japan.
Metal, all forms	21	39	Do.
Mercury—76-pound flasks	r 1,731	1,616	Mainly from Mexico.
Molybdenum metal, all forms—kilograms	7,934	11,820	United States 6,023; Netherlands 5,288.
Nickel:			
Sulfate	264	301	Mainly from Belgium-Luxembourg.
Metal:			
Scrap	1	27	Mainly from United States.
Refined	277	475	United States 236; Canada 193.
Semimanufactures	285	404	United States 179; West Germany 104; France 84.
Platinum-group metals:			
Platinum, unwrought—troy ounces	1,073	2,733	Mainly from United States.
Platinum, semimanufactures—do	75	7,845	Mainly from West Germany.
Platinum, manufactures [1]—do	96	96	Mainly from United States.
Other, unwrought—do	7	772	Mainly from United States.
Other, semimanufactures—do	18	193	All from United States.
Radioactive and associated materials:			
Radium—milligrams	25	----------	
Other radioactive chemical elements and their isotopes and compounds—value	$35,296	$222,521	Mainly from United States.
Stable isotopes and their compounds—value	----------	$441	All from West Germany.
Other compounds of thorium and uranium and of rare earth metals—kilograms	10,842	11,690	United States 6,295; Republic of South Africa 2,083.
Selenium—kilograms	1,687	7,764	Canada 5,218; United States 1,893.
Silicon metal	272	665	France 270; Sweden 215; Norway 155.
Silver:			
Bullion—troy ounces	734,001	970,308	Peru 395,807; Mexico 383,912; United States 82,563.
Semimanufactures—do	31,379	354	Mainly from United Kingdom.
Sodium metal—kilograms	5,303	7,335	Mainly from West Germany.
Tantalum, semimanufactures—do	11	76	All from United States.
Tellurium—do	(2)	51	Mainly from United States.
Tin:			
Cassiterite concentrates—long tons	1,184	233	All from Netherlands.
Oxides—do	33	55	United Kingdom 33; West Germany 22.
Metal, all forms—do	2	4	Mainly from Japan.
Titanium:			
Oxides, manufactured	6,559	9,920	United Kingdom 3,725; Belgium-Luxembourg 2,573.
Rutile	----------	446	All from Australia.
Tungsten:			
Wolframite concentrates	----------	10	All from Peru.
Metal, all forms—kilograms	2,539	5,915	United States 2,889; Netherlands 1,805.
Zinc:			
Oxides	305	305	Poland 187; Yugoslavia 54.
Lithopone	6,078	5,535	Netherlands 2,188; Belgium-Luxembourg 677.
Metal:			
Refined	31,574	41,485	Peru 12,372; Mexico 7,613; Belgium-Luxembourg 5,249; Poland 4,833.
Semimanufactures	443	210	Belgium-Luxembourg 130; Mexico 75.
Zirconium ores	----------	1,016	All from Australia.
Metallic oxides, not specified	177	309	United States 105; West Germany 79.
Other [3]	19	8	Mainly from United States.
Nonmetals:			
Abrasives:			
Natural [4]	59	494	Mainly from Italy.
Corundum, artificial	271	137	West Germany 95; United Kingdom 21.
Silicon carbide	175	250	United States 122; Norway 89.
Carbides, not specified	17	13	Mainly from Sweden.
Asbestos:			
Fiber	15,151	18,948	Canada 15,742; Republic of South Africa 1,730.
Construction materials	108	171	United Kingdom 52; West Germany 52; United States 21.

See footnotes at end of table.

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Table 4.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Barium compounds: [5]			
Barite	30	46	All from United States.
Sulfate	539	346	Mainly from West Germany.
Oxide kilograms	7,301	18,381	All from United States.
Boron:			
Borax, crude	50	1,180	Mainly from United States.
Sodium borates, purified	7,209	7,910	Argentina 4,711; United States 3,076.
Boric acid	879	925	Mainly from United States.
Bromine kilograms	185	13,701	West Germany 10,173; Netherlands 3,495.
Caustic potash	586	1,410	United States 987; France 216.
Caustic soda	96,309	149,396	United States 55,827; United Kingdom 27,915; Italy 27,521.
Cement:			
Portland, common	42,683	92,288	Uruguay 60,639; Columbia 27,221.
Refractory	306	580	Mainly from United States.
Nonspecified cements	539	633	Mainly from West Germany.
Chalk, natural	1,409	2,404	France 1,041; Denmark 745; East Germany 445.
Clays:			
Bentonite	4,548	8,618	United States 5,598; Argentina 2,745.
China clay	r 94	480	United States 365; United Kingdom 115.
Refractory clay	3	82	United States 57; West Germany 23.
Nonspecified clays	448	439	Mainly from United States.
Cryolite:			
Natural	1,003	1,093	Mainly from Denmark.
Synthetic	703	731	Canada 531; West Germany 200.
Diatomite and infusorial earth	1,694	2,025	Mainly from United States.
Dolomite	----	56	Italy 50; United States 5.
Fertilizer materials:			
Nitrogenous:			
Chilean nitrates	52,757	46,789	All from Chile.
Other	223,000	261,842	West Germany 98,681; United States 87,257; Belgium-Luxembourg 28,288.
Phosphatic:			
Phosphate rock, natural	154,718	112,199	Mainly from United States.
Superphosphate	5,776	6,462	Netherlands 5,000; United States 1,462.
Triple superphosphate	49,731	52,338	Mainly from United States.
Thomas slag	5,635	6,153	West Germany 4,172; Belgium-Luxembourg 1,981.
Other	2,726	3,457	Japan 1,517; Belgium-Luxembourg 1,440.
Potassic:			
Potassium chloride	155,356	144,091	United States 61,196; West Germany 24,584; France 22,774.
Other compounds	7,969	8,600	Belgium-Luxembourg 4,570; West Germany 3,530.
Mixed and nonspecified fertilizers	----	199	Japan 100; West Germany 99.
Graphite, natural	180	126	United States 81; West Germany 45.
Gypsum	855	2,046	Mainly from Bolivia.
Iodine kilograms	16,375	22,391	Chile 10,000; Argentina 4,750.
Magnesium oxide	80	125	France 50; United States 27; West Germany 23.
Mica:			
Sheet, block, scrap, or ground kilograms	318	1,794	All from United States.
Manufactures do	21,892	22,490	Mainly from United States.
Mineral pigments:			
Iron oxides, natural or synthetic	760	1,029	West Germany 598; Spain 398.
Earth colors kilograms	10,807	12,534	Mainly from France.
Phosphorus, elemental	148	180	West Germany 98; United Kingdom 50.
Refractory bricks and similar products	3,629	5,890	Mainly from United States.
Salt	249,509	197,268	Bahamas 117,441; United States 50,431.
Silex or flintstone, crude	r 84	210	Denmark 109; Belgium-Luxembourg 100.
Soda ash	4,606	2	All from United States.
Sodium sulfate	10,476	14,284	Mexico 7,676; East Germany 5,722.
Stone, dimension: Marble, worked or unworked.	92	29	Mainly from Italy.
Sulfur:			
Crude	192,337	166,968	Mainly from United States.
Refined	371	544	United States 307; Belgium-Luxembourg 198.
Other [3]	7	3	United States 2; West Germany 1.

See footnotes at end of table.

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Table 4.—Brazil: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Mineral fuels:			
Carbon black	2,815	4,782	United States 2,751; Argentina 823; West Germany 595.
Coal:			
Anthracite	1,633	2,261	Mainly from United States.
Bituminous	1,046,176	1,742,164	Do.
Coal coke	124,808	57,840	Mainly from West Germany.
Mineral waxes	281	932	Mainly from United States.
Petroleum:			
Crude—thousand 42-gallon barrels	r 75,535	83,869	Venezuela 23,842; U.S.S.R. 16,725; Saudi Arabia 14,918; Iraq 14,455.
Refinery products:			
Gasoline—do	r 1,449	1,159	Mainly from Netherlands Antilles.
Kerosine—do	r 12	11	All from United States.
Jet fuel—do	r 2,166	2,104	Venezuela 1,145; Netherlands Antilles 959.
Residual fuel oil—do	r 128	113	All from Venezuela.
Lubricants—do	r 1,421	2,036	United States 1,388; Netherlands Antilles 285.
Liquefied petroleum gas—do	r 1,952	2,861	Mainly from Venezuela.
Paraffin and Vaseline—do	r 96	154	United States 70; Japan 43.
Petroleum coke	11,150	14,204	Mainly from United States.
Asphalt and asphalt mixtures	377	269	Mainly from Norway.
Other refinery products	1	3	United States 2; West Germany 1.
Mineral tar and crude chemicals from coal, petroleum, and natural gas.	51,061	38,930	Venezuela 12,406; Netherlands Antilles 11,927; United States 9,719.

r Revised.
[1] Excludes jewelry and other ornamental items.
[2] Less than ½ unit.
[3] Includes some material not identified by commodity in source, and commodities not listed separately in table.
[4] Includes emery, pumice, and diamond and other gem stone dust. Excludes millstones and grindstones.
[5] Excludes lithopone, which is listed under zinc.

Source: Servico de Estatística Econômica e Financeira, Comércio Exterior.

COMMODITY REVIEW

METALS

Aluminum.—Companhia Brasileira de Alumínio continued production of aluminum at its Sorocaba, São Paulo, facility at about the 1966 level of 17,000 tons. Power shortage was reportedly the cause of the failure to exceed 75 to 80 percent of capacity. The company continued construction of an additional 28,000-ton plant in the State of São Paulo, to be completed during 1970, contracting with Montecatini-Edison of Italy for 180 new furnaces.

Alumínio Minas Gerais (ALUMINAS) operated its aluminum smelter at Saramenha at about 85 percent of its 23,000-ton capacity during the year. The company's expansion program proceeded steadily; in addition to the hundred 55-kiloampere pots operating at the end of 1966, 22 were added in 1967 and eight more were planned for 1968. Four of the smaller 25-kiloampere pots were to be added in 1968 to the 52 already in operation.

During 1967, the Companhia Mineira de Alumínio (ALCOMINAS) essentially completed arrangements to erect a 25,000-ton aluminum plant; work crews began preparing the plant site, near Poços de Caldas, Minas Gerais, late in the year. The enterprise will require $54 million, of which the owners—the State of Minas Gerais, Aluminum Company of America, and the Hanna Mining Company—will raise 40 percent.

A reduction of the Brazilian tariff on raw aluminum to 10 percent ad valorem became effective on June 17 to consumers also purchasing domestic aluminum in a 2:3 ratio.

Columbium.—Brazilian pyrochlore production in 1967 continued at about the 1966 rate, despite suspension of operations at Araxá during part of November and December. During a period of decreased demand, the mill was shut down and a new continuous-leaching plant was installed. Concentrates are leached with

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caustic soda to remove phosphorus and sulfur.

This was the first full year of operation at Araxá under the new corporate name of Cía, Brasileira de Metalurgia e Mineração (CBMM). The company's expansion projects have brought mill capacity to 500 tons of concentrate monthly. The ferrocolumbium plant was producing 40 tons of alloy per month, and was slated to be expanded to a 50-ton rate.

Copper.—Brazil's 1967 copper production was less than 10 percent of requirements in a year when the price of imports was higher than normal. The only active mine was the Mina de Camaquã in Rio Grande do Sul, owned and operated by Cia. Brasileira do Cobre. This company, with technical assistance from the Mitsubishi Metal Mining Co., has been exploring its Mina Caraíba, with a view to resuming production.

Geologists of the Departmento Nacional de Produção Mineral (DNPM) and the Superintendencia de Desinvolvimento do Nordeste (SUDENE) continued to explore a large area of copper mineralization around Vale do Carurá, Bahia. Final data are not available, but studies to date indicate many millions of tons of ore containing 1 to 2 percent copper.

Also in Bahia, a copper deposit was reportedly found by West German engineers at Riacho Secon.

Iron Ore.—Brazilian production and exports set new records in 1967; preliminary figures are 23.5 million and 14.5 million tons, respectively. Cia. Vale do Rio Doce (CVRD) continued as the major factor in both production and exports. CVRD's production amounted to 12.4 million tons; next in quantity was Cia. Siderúrgica Nacional (CSN), which produced 1.5 million tons of immediately usable ore, and stockpiled an additional 600,000 tons of fines. CSN continued to work the Casa da Pedra mine, and shipped its entire production of usable ore to its Volta Redonda furnaces.

Exports from the ports of Tubarão-Victoria and Rio de Janeiro were 11.66 million tons and 2.82 million tons, respectively. About three-fourths of CVRD's 10,816,000 ton export went to western Europe; West Germany was the leading purchaser. In 1967, a larger proportion of CVRD's exports was relatively lower priced fine ore.

During the year, CVRD (1) built an ore dressing research laboratory, (2) began building a 2-million-ton-per-year pelletizing plant, (3) began grading a rail spur between Fabrica and Costa Lacerda, Minas Gerais, (4) acquired 70 million tons of additional iron ore reserve in two deposits, Timbopeba and Picarrão, (5) contracted with Japanese interests to sell 35 million tons of ore (mostly fines) over a 12-year period, (6) contracted with Japanese firms for construction of two 104,000-ton ore-oil carriers, and (7) dredged the port at Tubarão to accommodate such carriers.

S.A. Mineração da Trindade (SAMITRI) began a program to expand its annual output to 8 million tons, and Ferteco was actively developing its Fabrica Patriotica property. Both of these producers shipped part of their export tonnage from Tubarão and the remainder via Rio de Janeiro. A group of small producers in the Rio Doce Valley have formed an association to contract with CVRD to haul their ores to Tubarão for export. The plans of Mineraçoes Brasilerias Reunidas, S.A. (MBR) to build a 20-million-ton-annual-capacity loading port on Sepetiba Bay, was in an advanced stage.

United States Steel, through its subsidiary Cia. Meridional de Mineração, has announced discovery of extensive areas of surface iron mineralization near the Itacaiunas River, in the Serra dos Carajas region of Pará. The ore appears to be of shipping grade. Since the discovery was made in the course of general geologic reconnaissance, application for a "pesquiza" (authorization to prospect) has been filed. Discoveries were also reported from various points in Bahia, Pará, and Rio Grande do Norte. Recently released estimates of reserves include 15,000 million tons of jaspilite in Mato Grosso, and several hundred million tons of Clinton-type ore in the Rio Jatapu area of northeastern Amazonas.

Iron and Steel.—Production of steel in Brazil in 1967 was 1 percent less than in 1966, the record year; pig iron production however was 6 percent greater. In early 1967, inventories were high, and domestic demand was slightly less than normal. However, exports showed a marked increase and supported the market. Argen-

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tina, Uruguay, the United States, and Japan were major customers, principally for sheets and semimanufactured shapes.

Imports, principally of alloy steels and and special shapes, were substantial, continuing at about the 1966 rate. Since Brazil does not produce these items, they were principally supplied during 1967 by the United States, West Germany, Sweden, and Japan.

The Cia. Siderúrgica Nacional (CSN) maintained its position as Brazil's leading producer, accounting for 30 percent of total pig iron production, 32 percent of ingot steel, and 30 percent of rolled steel. Over 60 percent of Brazil's iron continued to be coke-reduced. Production of iron and steel by States in 1967 is shown in the following table:

State	Thousand tons	
	Pig iron	Steel ingots
Minas Gerais	1,592	1,361
Rio de Janeiro	1,031	1,358
São Paulo	476	836
Bahia, Guanabara, Mato Grosso, Paraná, Pernambuco, Rio Grande do Sul, Santa Catarina	-----	165
Total [1]	3,100	3,720

[1] Data provided by CSN. Difference between sum and total for pig iron due to rounding.

A prominent U.S. consulting firm, acting for the National Economic Development Bank (BNDE), completed a comprehensive survey of the Brazilian steel industry. Their report included the following recommendations: (1) Expansion of CSN to a yearly steel capacity of 2.5 million tons by 1972; (2) expansion of Usinas Siderúrgicas de Minas Gerais, S.A. (Usiminas) and Cia. Siderúrgica Paulista (Cosipa) to 1-million-ton capacity each as rapidly as possible; (3) erection, at Recife, Pernambuco, of a steel plant as planned by Usinas de Nordeste (Usinor); and (4) erection, at Corumbá, Mato Grosso, of a steel plant as planned by Cia. Siderúrgica do Mato Grosso.

MBR interests have a steel mill at Santa Cruz, Guanabara, along with a port and iron-ore loading facilities, in the advanced planning stage. In the same locality, on Sepetiba Bay, Cia. Siderúrgica da Guanabara plans similar facilities. Also projected is a ferroalloy plant of 33,000-ton capacity, to be erected near Salvador, Bahia, by Eletro Siderúrgica (Sibra).

Cia. Siderúrgica Belgo-Mineira was reorganizing and expanding during the year. Tube mill facilities were being concentrated at the Sabara works, and rolled product facilities at Monlevade. Expansion to 700,000 ingot tons annually was in process.

Late in 1967, work began on a special steel plant, Aços Finos Piratini, S.A., at Charqueadas, Rio Grande do Sul. The plant will produce 65,000 tons of sponge iron annually, and have a 280-ton-per-day electric furnace steel capacity.

Uranium.—During the year, operation on pilot-plant scale at a plant in São Paulo began; recovery of both zirconium (65–75 percent) and uranium (0.1–0.2 percent) from caldasite ores of Poços de Caldas, Minas Gerais, is intended.

In May 1967, a nuclear cooperation agreement between Brazil and France was signed. In an important feature, the French were to supply financial and technical aid to Brazil in her search for uranium deposits. Repayment may be in terms of currency or uranium ore; if enough ore is found to permit Brazil to export, France will enjoy a preferred position.

Provision for assistance to Brazil in uranium prospecting also form a part of cooperative agreements with Israel and Portugal; these agreements became effective in May 1966 and September 1967, respectively.

The Commissão Nacional de Energia Nuclear (CNEN) continued exploring for uranium and thorium in Bahia, Maranhao, Minas Gerais, Paraná, Pernambuco, and Piauí. Several hundred radioactive anomalies have been recorded by aerial reconnaissance in the Serra do Ibiapaba area in Piauí.

NONMETALS

Cement.—The upward trend in cement production continued during 1967. Production was from 27 plants which operated at about 90 percent of total installed capacity. Two plants in the State of Goiás were shut down late in 1966 and remained inactive during 1967; however, a new plant began producing in Sergipe. At yearend, plants were under construction at Sobral, Ceará; Montes Claros, Minas Gerais; and Lajes, Rio Grande do Norte.

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Diamond.—The converted gold dredge, adapted to diamond dredging by Mineração Tejucana, S.A., operated during the year north of Diamantina, Minas Gerais, on the Jequitinhonha River. From 1,000 to 3,000 carats of diamond and a little gold were recovered monthly; between 80 and 90 percent of the diamond was of gem grade.

Fertilizer Materials.—Natural phosphate output in 1967 consisted primarily of apatite from the States of São Paulo and Minas Gerais, although some phosphate rock was produced in the State of Pernambuco. The National Economic Development Bank (BNDE) announced a $1.56 million loan to Serrano S.A. de Mineração for construction of a 200,000-tons-per-year apatite concentration plant at Jacupiranga in the State of São Paulo.

The question of who should develop the potash deposits discovered near Carmópolis during 1965 remained unanswered. In an attempt to resolve the controversy, the Government issued a decree during August 1967 creating a natural reserve covering the area of the deposits and ordered the DNPM to determine, within a 2-year period, the value and extent of the potash deposits in this reserve.

During 1967, construction was initiated on a petrochemical fertilizer complex at Cubatão which, when completed in about 1969, will be the country's largest. This is a joint venture by Phillips Petroleum Co., International Finance Co., Ultragaz, and the Brazilian firm, Companhia Ultrafértil, S.A.

Lithium.—Production of lithium salts in Brazil was resumed in mid-1967 at a plant in São Paulo; an output of 120 to 150 tons annually, with eventual expansion to 250 tons per year, was planned. From 1956 to 1962 lithium salts were produced and monazite and zirconium minerals were processed at this facility by Indústrias Químicas Reunidas, S.A. (Orquíma). The plant was bought in 1965 by CNEN and turned over to the federally owned Administração da Produção da Monazita (APM) to operate.

MINERAL FUELS

Carbon Black.—Brazil's second carbon black plant, that of Companhia de Carbonos Coloidais, was under construction during 1967. This plant, scheduled for completion by mid-1968, is to have a capacity of 17,000 tons annually.

Coal.—Run-of-mine coal output continued to increase; 1967 production exceeded that of 1966 by 18 percent. However, owing to a decline in the ratio of washed coal to total output, usable production rose only 7 percent. Output of run-of-mine and washed coal by States during 1966 and 1967 follows, in thousand metric tons:

State	1966		1967	
	Run-of-mine	Washed	Run-of-mine	Washed
Paraná	246	183	316	226
Santa Catarina	2,576	1,182	3,097	1,269
Rio Grande do Sul	844	779	926	800
Total	3,666	2,144	4,339	2,295

Source: Comissão do Plano do Carvão Nacional.

Intensive field studies at reported coal occurrences in northern Brazil were initiated during 1967. Work performed in the State of Amazonas failed to indicate any deposits of commercial significance, and the studies involving Goiás, Pará, and Maranhão had not been completed by yearend. Official data on coal reserves at the end of 1967 follow:

State	Million metric tons
Paraná	41
Santa Catarina	1,205
Rio Grande do Sul	2,282
Total	3,528

Source: Comissão do Plano do Carvão Nacional.

Petroleum and Natural Gas.—Brazil's crude oil production rose 26 percent to 146,600 barrels per day in 1967, and natural gas output increased 11 percent to 84.6 million cubic feet daily. These increases occurred primarily in conjunction with the development of the relatively new Miranga and Carmópolis fields. Petróleo Brasilerio, S. A. (PETROBRÁS), the Government petroleum corporation, accounted for all crude oil and natural gas production. Most output was from fields in the State of Bahia and the nearby States of Alagoas and Sergipe.

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Proved reserves of crude oil increased 100 million barrels to a reported total of 800 million barrels at yearend 1967. Natural gas reserves as of that date totaled 865 billion cubic feet, approximately the same as at yearend 1966. **PETROBRÁS** increased its exploratory drilling activity during 1967, but geologic and geophysical surveying and development drilling declined as shown in the following tabulation:

		1966	1967
Geologic and geophysical exploration:			
Geologic surveying	party months	174	132
Seismic surveying	do	95	99
Gravimetric surveying	do	94	56
Electroresistivity sounding	do	45	34
Structural drilling	do	18	12
Total	do	426	333
Drilling:			
Wells drilled:			
Exploratory:			
Oil	number	32	25
Gas	do	2	4
Dry	do	64	81
Subtotal	do	98	110
Development:			
Oil	do	197	91
Gas	do	1	---
Injection	do	16	13
Dry	do	19	6
Subtotal	do	233	110
Total	do	331	220
Footage drilled	thousand feet	1,293	1,145

Source: Petróleo Brasileiro, S.A. PETROBRÁS Relatório de Atividades, 1967.

The first mobile offshore platform constructed in Brazil, *PETROBRÁS I,* was launched in 1967. This platform was equipped for open sea operations in water depths to 30 meters. PETROBRÁS also contracted for the services of Zapata Offshore Co.'s mobile offshore platform, *Vinegarroon,* for drilling in water depths up to 50 meters. Both platforms were expected to begin drilling on Brazil's continental shelf during 1968.

In 1967, refining capacity remained at 368,200 barrels daily. However, two new 45,000-barrel-per-day refineries were under construction: The Belo Horizonte (Gabriel Passos) plant, which was 70 percent complete at yearend, and the Canoas (Alberto Pasqualini) plant, which was 52 percent completed. Both were being built for PETROBRÁS, which already operated 84 percent of the country's refining capacity. Brazil's refined products output excluded lubricants for the second consecutive year as the lubricants processing unit at the PETROBRÁS refinery at Mataripe remained shut down due to operational problems.

PETROBRÁS reported that construction of a marine terminal and a 95-kilometer crude oil pipeline at Tramandaí, connecting it to the Canoas refinery, was 93 percent complete at yearend 1967. The company also reported that 84 percent of the work on the marine terminal at São Sebastião had been completed and that the crude oil pipeline, which will connect this terminal with Cubatão, was 35 percent complete.

During 1967, PETROBRÁS initiated preliminary construction work at the site of its planned prototype shale oil plant at São Mateus do Sul. Plans called for the construction of a 1,000-barrel-per-day retort which would use the Petrosix process developed by PETROBRÁS and the U.S. firm of Cameron and Jones, Inc. This process, a modification of the gas-combustion process developed originally by the U.S. Bureau of Mines, features an arrangement for heating the oil shale by circulating a stream of indirectly heated product gas through the retort.

Several petrochemical facilities, in addition to those described previously under "Fertilizer Materials," were completed or under construction in 1967. A 15,000-ton-

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per-year dodecylbenzene plant, the first in Latin America, was inaugurated at São Caetano do Sul in the State of São Paulo by Empresa Carioca de Produtos Químicas, S.A., a subsidiary of Atlantic Richfield Co. Conjunto Petroquimica Presidente Vargas (COPEV), a subsidiary of PETROBRÁS, placed a 33,000-ton-per-year butadiene unit on stream at its Duque de Caxias plant. New units for the extraction of aromatics and the pyrolysis of ethylene were being installed by PETROBRÁS at its Cubatão refinery.

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The Mineral Industry of Bulgaria

By Roman V. Sondermayer [1]

Copper, lead and zinc, coal, and construction materials remained the principal mineral products of Bulgaria in 1967. In addition the country produced barite, clays, chromite, iron ore, manganese ore, pyrite, salt, sulfur, and iron and steel. During the same year most of the new mineral industry investment and important developments were concentrated in the iron and steel, petroleum, and petrochemical sectors. At the Kremikovtsi iron and steel plant, the focal point of the country's ferrous industry a new semicontinuous sheet rolling stand was completed. Also reported was the discovery of a new oilfield and the beginning of construction of a new petroleum refinery near Pleven.

The position of the Bulgarian mineral industry in the world complex was insignificant, but for the domestic economy it was an important factor. In 1967 the mineral industry contributed approximately 12 percent to the social product [2] of Bulgaria and the industry and its related facilities employed about 300,000 persons.

Mineral commodity trade was significant to the economy of the country. Mineral industry exports, predominantly ores, concentrates and metallic lead, zinc, copper, and bismuth, continued to be an important source of foreign exchange. Imports, mostly of mineral fuels, iron ore, apatite, and semimanufactured metal products, were vital for the domestic industry. Although the U.S.S.R. and other Communist countries were the predominant trading partners of Bulgaria in both export and import, some trade was registered with France, Japan, West Germany, and Austria.

Soviet assistance in developing mineral resources continued during 1967, and the U.S.S.R. remained the principal supplier of equipment and technology. To a lesser extent East Germany, Czechoslovakia, and France also assisted Bulgaria. In spite of foreign assistance the development of the mineral industry was slow because of the centralized economy, shortages of materials, lack of worker's incentives, and political interference in management. Although many Communist countries introduced some kind of economic reforms, Bulgaria remained loyal to the conservative Communist economic principles of the highly centralized economy.

PRODUCTION

Output of most metals and minerals increased in 1967. The share of total output obtained from low-grade ores was higher than in the past. Mass production methods began to be introduced in both surface and underground mining.

In the petroleum industry the Bulgarians used conventional rotary drilling and turbodrill. Shutlown time, transportation, and production testing time of an average Bulgarian drilling rig averages about 70 percent of total available rig time. Bulgarians used conventional methods for production of crude oil. Reservoir pressure maintenance projects were not reported.

[1] Foreign mineral specialist, Division of Internatonal Activites.

[2] As in other Communist countries of East Europe, Bulgaria does not report on its gross national product (value of all final goods and services produced) but rather publishes a figure for the social product, which generally excludes items such as banking fees, rent, education, defense, public administration, and health services.

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Table 1.—Bulgaria: Production of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967 [ep]
Metals:					
Copper:					
Ore, gross weight---thousand tons	2,109	2,202	4,458	[e] 4,500	4,500
Content of ore---do	[r] 21	20	30	[e] 31	31
Concentrate (20 percent)---do	91,887	91,500	120,734	[e] 125,000	125,000
Blister---do	20,522	21,102	25,248	[e] 26,000	27,000
Electrolytic---do	19,797	20,600	23,885	[e] 25,000	26,000
Rolled products---do	12,115	13,722	[e] 14,000	NA	NA
Iron and steel:					
Iron ore, gross weight thousand tons	655	716	1,801	2,608	2,700
Iron content of ore---do	254	257	585	[e] 760	780
Pig iron and ferroalloys---do	265	457	695	[r] 869	992
Steel ingots---do	461	475	588	[e] 700	1,239
Rolled products---do	353	363	431	[e] 440	609
Lead:					
Lead-zinc ore, gross weight---do	4,189	4,361	4,452	[e] 4,500	4,700
Lead content of ore---do	88,900	91,300	100,000	[e] 100,000	103,000
Lead concentrate (70 percent)---do	127,053	130,400	130,098	[e] 130,000	133,000
Refined---do	51,332	87,499	93,421	[e] 90,900	92,000
Manganese ore---do	38,494	52,000	42,000	[e] 42,000	43,000
Zinc:					
Zinc content of ore [2]---do	[r] 73,600	[r] 78,300	[r] 79,600	[r] 80,000	80,000
Zinc concentrate (52 percent)---do	[r] 111,850	[r] 127,053	[r] 130,098	[e] 130,000	130,000
Refined---do	56,064	[r] 58,573	65,764	[e] 60,000	65,000
Nonmetals:					
Asbestos [e]---do	1,200	[r] 1,300	1,300	1,300	1,300
Cement:					
Portland---thousand tons	2,120	2,586	2,634	NA	NA
Pozzolan---do	85	47	47	NA	NA
Total---do	2,205	2,633	2,681	2,856	3,358
Fertilizers:					
Nitrogenous, nitrogen content---do	100,947	205,394	245,834	[e] 250,000	NA
Phosphatic, phosphorus pentoxide content---do	70,571	90,290	93,672	[e] 94,000	NA
Gypsum:					
Crude---thousand tons	100	129	174	[e] 180	NA
Calcined---do	12	16	13	[e] 13	NA
Kaolin---do	77	83	95	[e] 100	NA
Lime, crude---do	753	834	851	NA	NA
Pyrite concentrate (42 percent)---do	129,933	146,849	152,916	[e] 160,000	170,000
Refractories, all types---do	86,300	100,100	123,500	[e] 125,000	130,000
Salt---thousand tons	105	82	125	[e] 125	125
Sulfur---do	6,892	6,828	10,121	[e] 11,000	12,000
Mineral fuels:					
Coal:					
Anthracite---thousand tons	217	221	190	[e] 170	NA
Bituminous---do	441	[r] 378	362	[e] 320	NA
Lignite and brown---do	20,275	23,751	24,490	24,624	28,800
Coke---do	128	471	733	[e] 750	NA
Fuel briquets [e]---do	1,250	1,500	1,500	NA	NA
Petroleum:					
Crude---thousand tons	173	160	229	[e] 400	499
Refinery products:					
Gasoline---do	68	307	371	NA	595
Kerosine---do	8,369	41,853	[r] 73,000	NA	92,000
Diesel fuel---thousand tons	117	494	NA	NA	9,401
Fuel oil---do	265	1,000	1,097	NA	1,448
Lubricants---do	34	45	46	NA	NA

[r] Estimate. [p] Preliminary. NA Not available.

[1] In addition to reported commodities Bulgaria is known to produce bismuth, cadmium, gold, silver, barite, clays, salt, and chromite.

[2] For gross weight of ore, see lead entry.

Sources: Statisticheski Godishnik na Narodna Republika Bulgaria—1965 (Statistical Yearbook of the Peoples Republic of Bulgaria for 1965). Sofia, 1965, 559 pp. Rabotnichesko Delo (Sofia), Jan. 29, 1967.

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TRADE

With small exceptions, data on foreign trade in minerals were not made public during 1966. Partial information from the Soviet Union was compiled to produce tables 2 and 3. Most of the figures are incomplete and do not represent total Bulgarian mineral trade.

Table 2.—Bulgaria: Exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

	1965	1966	Principal destinations, 1966
Metals:			
Aluminum and alloys:			
Scrap	190	114	All to United Kingdom.
Unwrought and semimanufactures	164	954	West Germany 694; Belgium-Luxembourg 260.
Cadmium	8	2	All to Poland.
Copper and alloys, unwrought and semimanufactures.	1,608	4,870	West Germany 1,074; Japan 796; Italy 782.
Iron and steel:			
Iron ore	[2] 10,609	NA	
Iron oxide and hydroxide	NA	200	All to Yugoslavia.
Scrap	113	327	Austria 623; Japan 204.
Pig iron—thousand tons	[2] 301	327	Japan 235; Austria 30; Yugoslavia 28.
Steel:			
Ingots and equivalent forms	[2] 10	63	Austria 22; Turkey 14; Yugoslavia 14.
Semimanufactures	42	26	Yugoslavia 19; Italy 3; Turkey 2.
Lead:			
Oxides	NA	149	All to West Germany.
Scrap	339	997	All to Austria.
Unwrought	[2] 53,466	30,801	United Kingdom 7,682; Italy 5,489, Netherlands 5,103; U.S.S.R. 4,800.
Silver and platinum group metals. thousand troy ounces	2,148	[3]	
Titanium oxides	NA	154	All to Turkey.
Zinc and alloys, unwrought	[2] 51,499	35,162	United Kingdom 13,339; Italy 7,854 West Germany 2,942.
Nonferrous metals, n.e.s.:			
Metal-bearing wastes of nonferrous smelters.	898	1,223	West Germany 761; Belgium-Luxembourg 376; Italy 81.
Scrap	16	82	Italy 63.
Ores and concentrates	12,289	11,656	All to U.S.S.R.
Unwrought and semimanufactures	159	269	West Germany 181; Netherlands 61.
Nonmetals:			
Abrasives: Grindstones and wheels	16	87	All to Yugoslavia.
Asbestos	984	1,385	All to Poland.
Barite	28,600	34,100	All to U.S.S.R.
Cement—thousand tons	[2] 715	102	Spain 74; Yugoslavia 28.
Clay	1,343	NA	
Clay products	NA	1,272	Spain 916; Yugoslavia 356.
Feldspar and fluorspar	915	2,887	Poland 1,516; Yugoslavia 1,371.
Fertilizer materials:			
Crude: Phosphatic	3,950	2,260	All to Italy.
Manufactured: Nitrogenous	57,970	18,968	Yugoslavia 16,932; Greece 2,036.
Sodium compounds: Caustic soda	1,281	1,377	All to Turkey.
Stone, dimension: Marble	777	1,078	All to West Germany.
Sulfur: Sulfuric acid	NA	16,074	All to Greece.
Talc and steatite	14,175	14,200	All to U.S.S.R.
Crude nonmetals, n.e.s	[2] [4] 84,941	561	All to Yugoslavia.
Mineral fuels:			
Petroleum:			
Crude	3,933	NA	
Refinery products:			
Distillate fuel oils	26,316	42,792	Yugoslavia 29,908; Greece 12,884.
Residual fuel oils	11,595	61,407	Greece 35,988; Italy 25,419.
Lubricants	4,830	3,295	All to Yugoslavia.
Nonlubricating oils	NA	422	Do.
Unspecified	4,021	2,435	All to Poland.

NA Not available (In this table, indicates no report).

[1] Official Bulgarian export data were not available for 1966 in time for inclusion in this table and such data for 1965 is incomplete, not listing all commodities exported. Figures in this table therefore have been compiled from a variety of sources, most notably the 1965 and 1966 editions of Supplement to the World Trade Annual, Volume I (Eastern Europe), prepared by the United Nations from trade returns of a number of major trading countries, and published by Walker and Company, New York. Other sources include the official trade returns of Bulgaria for 1965 and of the U.S.S.R. and Poland for 1965 and 1966. Export data from official Bulgarian sources is so noted; all other figures are recorded imports of listed countries, which have been used as a measure of Bulgarian exports.

[2] Official Bulgarian figures.

[3] Quantity not reported; value given as U.S. $1,907,000, all of which was to West Germany.

[4] May include (among others) asbestos, barite, clays, feldspar, fluorspar, marble, talc and steatite which are listed separately above, and which were obtained from non-Bulgarian sources.

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Table 3.—Imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys, unwrought and semimanufactures.	8,041	13,905	U.S.S.R. 10,000; West Germany 2,051; Austria 934.
Antimony	661	506	All from U.S.S.R.
Chromium: Chromite	3,117	14,815	All from Turkey.
Cobalt: Oxides and hydroxides	20	11	All from West Germany.
Copper and alloys: Unwrought and semimanufactures.	1,310	2,992	U.S.S.R. 1,192; Austria 1,023; Spain 354.
Iron and steel:			
Iron ore—thousand tons	842	908	All from U.S.S.R.
Iron oxide	279	857	All from West Germany.
Pig iron—thousand tons	159	137	Mainly from U.S.S.R.
Ferroalloys—do	10	13	U.S.S.R. 11; West Germany 2.
Steel:			
Ingots, blooms, billets and slabs—do	19	8	Poland 7.
Semimanufactures—do	588	728	U.S.S.R. 437; Italy 82; West Germany 48.
Magnesium, unwrought	150	150	All from Italy.
Mercury—76-pound flasks	NA	261	Do.
Nickel and alloys; unwrought and semimanufactures.	179	193	Italy 157; West Germany 36.
Platinum—value, thousands	NA	$129	All from West Germany.
Silver—do	NA	$6	Do.
Tin:			
Oxide—long tons	7	20	Do.
Metal and alloys, unwrought and semimanufactures—do	231	125	Belgium-Luxembourg 100; Netherlands 25.
Titanium oxide	838	596	Italy 333; West Germany 263.
Tungsten and alloys, all forms	8	NA	
Zinc: Ore and concentrate	NA	5,412	Turkey 5,000; Yugoslavia 412.
Metals, n.e.s.:			
Ores and concentrates	[2] NA	867	All from Australia.
Metalloids, n.e.s	130	165	All from France.
Metals and alloys, n.e.s	1,321	1,724	U.S.S.R. 1,692; Belgium-Luxembourg 32.
Nonmetals:			
Abrasives: Grindstones and wheels	63	44	All from West Germany.
Asbestos	12,700	16,400	All from U.S.S.R.
Boron compounds:			
Crude borates	NA	2,000	All from Turkey.
Boric acid and oxide	NA	300	Do.
Cement—thousand tons	101	73	U.S.S.R. 53; Poland 20.
Clay products, refractory	30,292	37,052	U.S.S.R. 32,500; France 1,978; West Germany 1,608.
Diamond, industrial—value, thousands	-------	$48	All from Belgium-Luxembourg.
Fertilizer materials:			
Nitrogenous, manufactured	-------	52,685	All from France.
Phosphatic:			
Crude, apatite	207,800	288,600	All from U.S.S.R.
Manufactured	163,961	161,961	Yugoslavia 85,770; U.S.S.R. 37,800; Spain 28,143.
Graphite	1,100	1,400	All from U.S.S.R.
Sodium compounds: Caustic soda	400	6,000	All from Yugoslavia.
Mineral fuels:			
Carbon black	4,111	3,622	U.S.S.R. 1,641; France 741; Yugoslavia 630; Italy 610.
Coal, bituminous and anthracite—thousand tons	2,504	3,047	All from U.S.S.R.
Coke—do	274	210	U.S.S.R. 158; Poland 52.
Petroleum:			
Crude—do	2,146	2,623	All from U.S.S.R.
Refinery products:			
Gasoline—do	141	155	Do.
Kerosine—do	11	10	Do.
Diesel oil—do	288	213	Do.
Residual fuel oil—do	794	933	Do.
Lubricants—do	47	53	U.S.S.R. 51.
Paraffin—do	2	3	All from U.S.S.R.
Bitumen—do	20	26	All from U.S.S.R.
Unspecified—do	2	7	All from Greece.

NA Not available.

[1] Owing to the incompleteness of official Bulgarian data on imports; this table has been compiled wholly from data on exports of other countries to Bulgaria. Sources used include official trade returns of the U.S.S.R and Poland and the 1965 and 1966 editions of Supplement to the World Trade Annual, prepared by the Statistical office of the United Nations and published by Walter and Company, New York.

[2] Nonferrous ores and concentrate with a total value of $19 million were exported to Bulgaria by several non-Communist countries; these were undescribed except that they did not include chromite.

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Imports of minerals and related products accounted for roughly one-fifth of total imports in 1966. Fuels and metal semimanufactures were principal import items. Exports of minerals contributed one-tenth of total Bulgarian export value in 1964. Nonferrous metals were the principal export items.

COMMODITY REVIEW

METALS

Copper.—Facilities were being expanded at the Medet opencast copper mine and beneficiation plant, the largest producer of copper ore and concentrates in the country. Reportedly, capacity of the mine and the benefication plant will reach 8 million tons of copper ore per year in 1970. In the G. Damyanov Copper Extraction Plant a new unit for sulfuric acid production went on stream in the summer of 1967. Bulgarians claim an output of 75,000 tons of sulfuric acid per year from the new facility. Exploration of the Eteropole Copper Deposit continued during 1967 and results confirmed the findings of preliminary work made in 1965 indicating that the ore deposit was large but of low grade.

Gold.—Because of a higher demand and inadequate gold supply from complex ores, Bulgarian authorities started to reconsider Bulgarian gold-bearing river sands as a possible source of additional gold. Reportedly 200 streams have gold-bearing sands. However, in the past, low gold content made production unprofitable.

Iron and Steel.—During 1967 the Kremikovtsi Metallurgical complex near Sofiya was the principal theater of activities in the Bulagrian ferrous industry. A 1,700-millimeter semicontinuous sheet rolling stand was completed in the fall, and another steel converter was added to the two existing ones in the steel plant. The new converter brought total Bulgarian steel output to 1.3 million tons per year.

In addition to lagging behind schedules set for completion of the complex, the Kremikovtsi combine has had serious difficulties in maintaining product quality at the level of Bulgarian standards. According to a report in the Bulgarian press, the quality of Kremikovtsi products was neglected. During 1967 approximately 71 percent of iron ore concentrates delivered to the smelter were substandard. Consequently pig iron output was below standard for quality and fuel consumption was high. Steel quality also was inferior to requirements and rejects amounted to 8 percent. The Kremikowtsi plant was built according to Soviet design and specialists from the U.S.S.R supervised construction and production in 1967.

The "Lenin" Metallurgical Plant in Pernik began production of steel balls used in milling facilities at minerals beneficiation and cement plants. Capacity of the new facility was reported to be 20,000 tons of steel balls per year.

Manganese.—A manganese deposit near Obrochistse (Oboriste) village in Tolbukhin Okrug was being developed during 1967. The driving of the first shaft encountered difficulties at the depth of 307 meters. Water and sand prevented driving of the shaft for 29 days in the spring.

NONMETALS

Borax.—At the Devnya Chemical Complex near the town of Devnya a new borax plant was under construction during 1967. When completed in 1968 the plant will reportedly have an annual capacity of 10,000 tons of borax. Plant operations will be based on imported colemanite.

Cement.—After trial production since summer 1967 a new cement plant named "General Valdimir Zaimov" was commissioned near Pleven close to the old plant. Reportedly capacity of this highly automated plant is 500,000 tons of cement per year.

Clays.—A shamot and kaolin plant was under construction near Vyatovo village during 1967. The Bulgarian press reported the capacity of the plant to be about 1 million tons of raw clay per year yielding 140,000 tons of kaolin and 10,000 tons of shamot.

Fertilizer Materials.—Preparatory work has begun for the construction of Bulgaria's first combine for production of complex nitrogen-phosphoric fertilizers. The plant with a planned annual capacity of 700,000 tons of complex fertilizers is situated near the area where the new Varna-

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Zapad (Varna-West) harbor will be built. The completion date was not announced.

Gypsum.—The Vidin gypsum mine at Koshava was connected with Vidin by a new 19-kilometer railroad line. The new line will speed up deliveries of raw gypsum to the facilities at Vidin.

MINERAL FUELS

Coal remained Bulgaria's principal source of energy during 1967. Imports of high-rank coal, crude oil, and refined petroleum products were necessary because the country's solid fuel output consisted mostly of low-rank coals; domestic crude oil output was insignificant, and petroleum refining capacity in Bulgaria was inadequate to satisfy demand.

Coal.—Development of a new bituminous coal mine started near Burgas. Reportedly, reserves are about 19 million tons and the new mine will have an annual capacity of 450,000 tons when completed in 1972.

At the Maritsa Basin, the largest lignite basin in Bulgaria, a new mine, Mercheli-3, was being developed during 1967. The mine will supply lignite to the large thermal power plants in the area. The target completion date and the capacity of the new mine were not reported.

Petroleum.—A new oilfield was discovered near the village of Gorni Dubnik, close to Pleven, and next to the Dolni Dubnik operation. The payzone is at a depth of 3,500 meters and the crude oil in the new field is similar to that from Dolni Dubnik. At yearend, two drilled wells were reportedly successful and rigs were being readied for drilling at three other locations. Preparations for exploratory offshore drilling in the Black Sea near Shabla village in the general area of Tyulenovo continued during 1967. Under the supervision of experts from the U.S.S.R., construction of an artificial island was underway. The platform will be located 1,300 meters offshore and plans call for drilling several directional wells. At yearend the offshore trestle was completed and work on the drilling platform started.

At the site of the Burgas Petroleum Refinery which operates on crude oil imported from the U.S.S.R, a new facility for the production of benzol was under construction during the year. Reportedly annual capacity will be 20,000 tons of benzol and 20,000 tons of toluol.

Construction of a new petroleum refinery, located between the villages of Yasen-Trnene and Desevitsa near Pleven, started in summer of 1967. The refinery will process crude oil from Gorni and the Dolni Dubnik oilfields. The refinery and a planned associated petrochemical plant were designed in the U.S.S.R, which was the principal supplier of equipment. Initial production at the refinery was scheduled for 1969 and the first stage of the petrochemical plant will start production in 1971 unless construction falls behind.

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The Mineral Industry of Burma

By Taber de Polo [1] and John M. West [1]

Burma's mineral industry in 1967 showed but little growth despite potentially significant resources of some commodities and government plans for development of the industry. Recent statistics on production, trade, and reserves of mineral commodities have been sketchy. However, there was an increase in output of crude oil, one of the more important mineral activities although it fell short of the planned target, and imports of crude oil as well as some products were necessary to meet domestic demand. The Bawdwin lead-silver-zinc enterprise was undergoing mine and plant modifications during 1966–67 with a view towards increasing production and improving operations; meanwhile, output was at reduced levels. As a result of neglect of mining properties, tin and tungsten production continued to decline.

Overall mineral output in 1967 contributed about 1.5 percent to Burma's Gross National Product (GNP), compared with about 33 percent for agriculture. During fiscal 1966–67, the country's GNP was estimated at $1,700 million.[2] Tax returns from minerals have been small; for minerals, the annual sum has been consistently less than $1 million in recent years.

Approximately 52,000 workers out of a labor force of 10 million and a population of 25.8 million were reportedly engaged in mining during 1967. Burma has little power to support mineral industry activities; installed capacity at yearend 1966 reportedly was only 191,000 kilowatts.

Under the new 4-year national economic plan for 1966–67 to 1969–70, special attention was to be given to mineral developments, such efforts to be financed entirely from domestic sources. The outlook appeared uncertain, however, for any significant achievement in view of recent performance.

The fiscal 1966–67 budget for national mineral development showed increased outlays by the Government: Expenditures planned for the People's Oil Industry were estimated at $16.85 million in 1966–67 compared with $9.56 million in 1965–66; for People's Bawdwin Industry Mines $2.48 million in 1966–67 compared with $270,000 in 1965–66; and for Mineral Development Corporation (MDC) $2.3 million compared with $1.18 million in 1965–66.

A large proportion of Burma's business sector is nationalized and only a little private foreign capital has been flowing into the country for industrial development. Nevertheless, the Government has shown a desire for foreign assistance, preferably multilateral aid under the Colombo Plan and/or from international organizations such as the United Nations, rather than bilateral aid. Total loans arranged for fiscal 1967–68 were reported at $11.6 million, compared with $6.66 million in 1966–67; while grants were $1.85 million for 1967–68 compared with $1.88 million in 1966–67. In 1967–68, the principal loans were expected to come from mainland China, East Germany, West Germany, and United States, and grants, from international organizations and the United States.

The Ministry of Mines formed a Geology, Petroleum, and Mining Advisory Council to last 2 years beginning January 2, 1967. Made up of the leading minerals men in Burma and headed by the Secretary of the Ministry of Mines, its primary functions are to advise the Minister of Mines on technical matters, submit long- and short-term plans for prospecting and extraction of oil, minerals and other resources, in accordance with available manpower, capital, and equipment.

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[1] Physical scientist, Division of International Activities.

[2] Burma's fiscal year is October 1 to September 30. Where necessary, values have been converted from Kyats (K) to U.S. dollars at the rate of K4.73=US$1.00.

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PRODUCTION

Income from minerals in 1967, estimated at $45 million, shows little change from previous record years. Output of some nonmetallics and refined petroleum were at higher levels, whereas production of most nonferrous metals declined. Petroleum and natural gas accounted for almost half the 1967 mineral output value.

Most of the important mining firms were Government-controlled, and the few private ones were handicapped by shortages of equipment and supplies. The ratio of public to private mine output was roughly $19 million to $6.3 million in 1965–66 and $27.5 million to $4.2 million in 1966–67. Thus, deemphasis of the private sector is further evident. The Government continued to maintain strict control of metal prices through marketing.

Table 1.—Burma: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Antimonial lead (18 to 20 percent Sb)	578	530	560	e 500	400
Copper matte (40 percent Cu)	430	348	320	236	340
Gold, refined—troy ounces	e 200	e 200	e 200	e 200	200
Iron and steel:					
Iron ore	4,250	5,000	5,000	10,000	NA
Steel ingot e	15,000	15,000	18,000	r 21,000	NA
Rolled steel e	12,000	12,000	15,000	r 20,000	NA
Lead:					
Concentrate (50 to 60 percent Pb)	32,936	31,002	r 32,253	NA	16,381
Refined metal (99.99 percent Pb)	17,738	18,053	re 16,000	re 14,000	13,000
Manganese ore	200	NA	600	-------	NA
Nickel speiss (20 to 23 percent Ni)	462	378	245	354	269
Silver, refined—thousand troy ounces	2,075	1,867	1,638	1,096	917
Tin concentrate (68 to 72 percent Sn)—long tons	795	830	664	355	346
Tin-tungsten concentrate (35 percent Sn and 30 percent WO_3)—long tons	1,284	957	606	r 367	171
Tungsten concentrate (55 to 65 percent WO_3)	89	86	27	r 45	95
Zinc concentrate (54 to 56 percent Zn)	15,224	14,666	r 14,255	r 10,890	8,418
Nonmetals:[1]					
Barite	1,930	NA	r 1,760	re 8,000	NA
Cement—thousand tons	124	131	r 135	r 141	140
Gypsum	8,350	9,150	450	e 2,000	2,000
Limestone	97,300	107,000	116,500	re 400,000	400,000
Marl	64,400	62,100	99,800	100,000	100,000
Salt	160,700	127,000	132,000	r 118,000	169,000
Mineral fuels:					
Coal, bituminous e—thousand tons	r 5	10	r 15	NA	NA
Gas, natural—million cubic feet	597	NA	NA	NA	NA
Petroleum:					
Crude—thousand 42-gallon barrels	4,761	4,164	4,065	r 4,255	4,500
Refinery products:					
Gasoline—do	1,238	1,216	1,300	1,467	1,452
Kerosine—do	854	923	1,050	1,478	1,398
Other [2]—do	1,280	1,356	1,450	3,021	3,402
Total—do	3,372	3,495	3,800	5,966	6,252

e Estimate. r Revised. NA Not available.

[1] Burma also produces a variety of semiprecious and precious stones, and minor quantities of talc, soapstone, fluorite, graphite, and clays.

[2] For 1963–65, diesel oil not included.

TRADE

Since 1963–64, the decline in overall exports has gone unchecked. Exports in 1965–66 were valued at $194 million, 16 percent below the previous year, and those for 1966–67 declined 29 percent to roughly $135 million. The mineral share for 1965–66 was about 5.4 percent of all exports, and that for 1966–67 was down to 4.3 percent, according to preliminary figures.

Data for 1964–65 showed that $5.2 million of refined lead (about 14,900 metric tons), $2.2 million of tin concentrate (about 800 tons), $1.7 million of zinc concentrate (about 14,000 tons), $1.5 million of refined silver (about 700 ounces), and $1.3 million of mixed tin and tungsten

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concentrate (about 780 tons) were exported. Almost all the zinc concentrate went to Japan, an important part of the lead went to India, and the bulk of the remaining commodities went to Japan, India, and various countries in East and West Europe. Breakdown data are not available after 1965. However, combined exports covering 1966 and designated as "metals and ores" were reportedly valued at just under $10 million (K46.8 million) and totaled roughly 3,400 metric tons. According to similar 10-month figures for 1967, mineral exports had further declined rather sharply. A modernization program of the People's Bawdwin Industry during parts of 1966 and 1967 disrupted production and resulted in smaller quantities of most nonferrous metals to be available for export.

The level of imports into Burma, including minerals, has declined in line with government policies to conserve foreign exchange and to try, at least, to keep trade from becoming too unbalanced. The value of overall imports, at an alltime high of $299 million in 1964–65, fell sharply to $170 million in 1965–66. A further drop to $141 million (provisional) was reported in 1966–67. Imports of mineral products during 1966–67, also generally less except for fuels according to preliminary figures, included $11.1 million in base metals and manufactures thereof (compared with $13.5 million in 1965–66), $2.1 million in coal and coke (compared with $1.28 million in 1965–66), and $1.25 million in chemical fertilizers (compared with $1.5 million in 1965–66). Data on fuel imports were not officially published in trade returns, but other sources indicated sizable imports of crude oil, lesser but significant imports of lubricants, and coal imports averaging 300,000 tons annually in recent years.

Table 2.—Burma: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal destinations, 1965
Metals:			
Copper:			
Matte	457	NA	(2)
Lead:			
Ore and concentrate	366	NA	(3)
Refined	e 16,000	e 14,000	India 4 3,357; France 1,016; United Kingdom 356.
Silver—thousand troy ounces	1,619	901	United Kingdom 747; West Germany 125.
Tin and tungsten:			
Tin ore and concentrate—long tons	909	974	Spain 525; Netherlands 332.
Tin-tungsten concentrate—do	59	231	All to Netherlands.
Tungsten ore and concentrate	415	376	West Germany 177; United Kingdom 127.
Zinc:			
Ore and concentrate	18,292	14,387	All to Japan.
Nonmetal:			
Gems, precious and semi-precious. kilograms	1,135	307	Japan 224.
Mineral fuels:			
Petroleum:			
Crude—thousand 42-gallon barrels	NA	42	All to Italy.
Partly refined—value	NA	$552,000	All to Australia.
Refinery products:			
Lubricants	75	NA	(3)
Waxes	2,823	3,436	Italy 2,717.

e Estimate. NA Not available.
1 Incomplete; compiled largely from import data of countries of destination.
2 All to West Germany in 1964.
3 All to Japan in 1964.
4 During April 1965 to March 1966.

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Table 3.—Burma: Imports of mineral commodities [1]

(Metric tons)

Commodity	1964	1965	Principal sources, 1965
Metals:			
Aluminum:			
Unwrought	491	718	All from Japan.
Semimanufactures	1,953	292	All from Japan.
Copper:			
Unwrought	429	-------	
Semimanufactures	351	890	West Germany 364; Japan 228.
Iron and steel:			
Primary forms	6,883	7,426	Japan 5,213; Italy 2,213.
Semimanufactures:			
Uncoated plates and sheets	5,027	12,432	Japan 8,311; United Kingdom 3,118.
Galvanized sheets	45,726	36,212	Japan 35,208.
Tinplate	13,124	13,097	All from Japan.
Other	13,750	21,852	Japan 16,004.
Zinc:			
Unwrought	300	712	All from Japan.
Semimanufactures	254	392	Belgium-Luxembourg 306.
Nonmetals:			
Asbestos	806	600	All from Canada.
Cement	2,165	1,280	All from West Germany.
Fertilizers, manufactured	9,425	25,500	All from Italy.
Sulfur	e 675	1,484	West Germany 775: Italy 609.

e Estimate.
[1] Compiled mainly from export data of source countries.

COMMODITY REVIEW

METALS

Iron and Steel.—Production of rolled products in fiscal 1965–66, at the Ywama steel mill in Insein, the country's only steel producer, was reported at 20,600 metric tons. Products included approximately 7,500 tons of bars and rods, 5,800 tons of sheets, and 4,000 tons of wire nails. The target for fiscal 1966–67 was some 29,000 tons of rolled products, but actual output probably was much below plan. Reported yearly capacity was 20,000 tons of steel ingots and 40,000 tons of rolled products.

Imports of iron and steel products in 1966 declined to approximately one-third the 1965 level. Japan accounted for the bulk of the imports, supplying 22,613 tons in 1966 and 77,830 tons in 1965.

An Iron and Steel Board was set up late in 1966 under the Minister of Mines for the express purpose of establishing iron and steel centers at suitable sites and to promote optimum use of Burmese resources, including iron ore reserves delineated in surveys by Krupp Industries of West Germany in 1963. At that time, known deposits were said to contain 66 million tons of iron ore; other deposits have been reported since then.

Lead, Zinc, Copper, and Silver.—Output from the People's Bawdwin Industry Mines, Burma's sole significant producer of nonferrous metals, has been declining slightly in recent years. Output in 1967 from this world-famous, long-time producer of lead, zinc, silver, and byproduct copper matte, nickel speiss, and antimonial lead, was only about one-fifth the pre-World War II levels. Lead concentrates were shipped from the Bawdwin mine to nearby Namtu for smelting and zinc concentrates were exported, mostly to Japan. The bulk of the refined lead went to India and Europe.

Reserves as of October 1963 were reported at 2.26 million tons of ore averaging 15.1 percent lead, 9.2 percent zinc, 0.85 percent copper, and 11.2 ounces of silver per ton. Since then reserve figures have been revised various times, to take into account low-grade ores. The latest report, in 1967, indicated 6 million tons of ore analyzing 11.2 percent lead, 5.6 percent zinc, 0.3 percent copper, and 7.8 ounces silver. The tonnage may be of the right order, but actual grade may be lower than indicated.

As the result of recommendations from a United Nations Special Fund survey conducted by British, Canadian, United States, and Thai specialists, reserves were redefined (as noted above), operations were slightly improved, and suggestions were made for enlarging facilities. A program

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for the expansion of the mill (from 160,000 tons of high-grade ore to 350,000 tons of lower grade ore annually) and the smelter was reportedly underway. It is not known, however, whether or not the smelter expansion plan was completed by the scheduled date of October 1, 1967.

Renewed interest was shown in copper deposits near Monywa in central Burma, about 110 kilometers west of Mandalay. Initial exploration begun in 1957 indicated large reserves (reportedly more than 100 million tons) of ore grading 0.5 to 1 percent copper. More recent studies are said to have confirmed 5 million tons averaging between 1 and 1.5 percent copper. The Burmese Government asked the Japanese Government and Japanese firms for assistance in developing the deposit and possibly for assistance in constructing a copper refinery on the basis of a joint venture. Japanese Overseas Mineral Resources Development Co. Ltd. was reportedly planning to make a study of the deposits. Other copper occurrences have been reported at Kalow and Bawsaing, in southern Shan State, but little data are available.

Nickel.—Nickel speiss production at the Namtu smelter in 1967 was much below the 348 tons reported for 1966.

Elsewhere, according to an unconfirmed report, a large nickel deposit of garnierite ore was said to have been discovered in the Mwehauk Mountain, Chin Hills. The ore zone is reportedly up to 300 meters wide and possibly 4.8 kilometers long. Reserves might be on the order of several tens of million tons of ore containing 0.5 to 3 percent nickel. Another nickel discovery with a large vein was reported for the Mawleik district, Snake Hill region, north of Kalemyo. Both reports may be rumors, but Burma's nickel potential bears watching.

Tin and Tungsten.—Burma's output of tin and tungsten was hampered by lack of mining equipment and explosives, causing decreased output from the principal Government sponsored mines—Mawchi in southern Shan State, the Yawa lode tin mine, and the Kyaukmedaung mine. Only a few private, small tin and wolfram mines were in operation during 1967, and their leases will not be renewed. Miners had little incentive to develop mines owing to the Government policy of setting prices considerably below world market levels. In mid-1966 the Government buying price was $1,400 per long ton of concentrate compared with the average market value of $2,330 per ton; in addition, there were often long delays in payments. Operating costs increased and replacement of equipment was difficult. Smuggling reportedly became rampant. The numerous routes across the border to the north and east made it difficult for the Government to control illict traffic. Actual production of tin in 1966 and 1967 probably was considerably higher than officially reported.

NONMETALS

Fertilizer Materials.—Burma's fertilizer requirements for fiscal 1966–67 was about 100,000 tons (about three times the 1964–65 level), and the need in 1969–70 may be as high as 470,000 tons. Thus, sizable expansion of purchases and imports by the Government was anticipated. Major increases would come in ammonium sulfate, ammonium phosphate, urea, and superphosphate varieties. Hitachi Shipbuilding and Engineering Co. of Japan was awarded a contract in 1966 to build a natural gas based 40,000-ton-per-year ammonia and 60,000-ton-per-year urea plant at Pakokku; construction reportedly was underway in 1967. Another chemical fertilizer plant at Chauk was also being built with foreign assistance.

Gem Stones.—Burmese jade continued to be of some significance in world circles. Output in 1966 reportedly totaled 210,980 troy pounds (valued at K680,000 or $144,000); production in 1967 was at least as much. Individual mines were licensed in areas where the Government was not able to operate. In theory, all privately-mined jade must be sold to the Government's Minerals Development Corporation; but many mines are in insurgent territory near the border, and some jade is presumably smuggled out of the country. The Government of Burma conducted its annual gem emporium in October, and stressed the fact that the marketing of jade, formerly held only in Hong Kong and Chinese gem centers, can also be done in Burma. In fact, much jade was cut and polished at a Rangoon plant built in early 1966.

Besides jade, Burma produced 36,600 carats of rubies, 61,200 carats of sapphires, and 27,000 carats of spinel in 1966, sub-

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stantial increases over production of 1965. The combined value of these three gem stones increased from $24,000 (K115,000) in 1965 to $131,000 (K621,000) in 1966.

Other.—Burma is said to have several million tons of barite reserves and may be producing about 700 tons monthly; two veins in Pyittawye Camp, Kyaukse District may contain more than 100,000 tons.

During 1967, it was announced that beryl occurs in southern Shan States, bentonite in Myahnit of Shweb District, gypsum in Myingyan District, graphite near Mogok, and fluorspar near Bawhnington in southern Shan States. Several hundred tons each of clays, talc, soapstone, manganese ore, and fluorspar are said to be produced annually.

MINERAL FUELS

Coal.—The Kalewa coalfield in northwestern Burma produced 15,170 tons of low-rank coal during fiscal 1966. Geological studies in 1966 revealed several new occurrences, with initial reserve estimates totaling around 2.5 million tons. During 1967 government engineers were further assessing prospects at Kalaw and Inbyin areas of southern Shan State, and in Kyobin area of Katha district.

Petroleum.—Although Burma's oil production made a slight gain in 1967 to 4.5 million barrels, the country still relied on imports for an estimated one-fourth of requirements. A program was underway to achieve self-sufficiency by 1970, when requirements might reach 7.7 million barrels.

All production has come from fields in the central Burma basin (Chauk, Yenangyaung, Prome, and Myanaung), with known combined reserves of 160 million barrels of oil as of October 1966, according to the chief geologist of the People's Oil Industry (POI). Individual field reserves were given as 105 million barrels for Prome and 26.5 million barrels for Myanaung. A new oil well near Myanaung was reported as producing 800 barrels per day, the highest figure for any well in Burma. Natural gas reserves of Burma were placed at over 4,000 million cubic feet.

POI continued to operate Burma's two oil refineries. The larger one, at Syriam, near Rangoon, is capable of refining 20,000 barrels per day on a 3-shift basis. In August 1966 it was reportedly refining crude oil at the rate of 11,900 barrels per day and principal products were gasoline (2,360 barrels per day), diesel oil (2,550 barrels), kerosine (1,900 barrels), and fuel oil (1,750 barrels). In March 1967 its daily crude processing rate reportedly was 13,400 barrels. As of August 1967, the refinery at Chauk was said to process 6,550 barrels of crude oil daily to produce gasoline (1,190 barrels), kerosine (1,180), diesel oil (1,750), fuel oil (1,070), and lesser quantities of other products. No aviation gasoline or lubricating oil was produced in 1967.

Although the Government does not publish information on crude oil imports, a report in June 1966 stated that the Government imported almost 1.5 million barrels of crude oil from U.S.S.R. and Indonesia in fiscal 1965. An August 1967 report stated that the POI called for bids for the supply of 130,000 barrels of crude oil and 600 tons of lubricating oils and greases. This presumably covers Burma's import requirements for fiscal 1968.

After the nationalization of the Burma Oil Company in 1963, the Government developed an oil exploration program for 1963–70, but this plan was abandoned because it was based on inadequate manpower and equipment and a new exploration plan was developed for 1966–80. The first objective of this plan is to make Burma self-sufficient in crude oil by 1970 through further developing existing fields. The second is to increase production to meet increased domestic requirements and provide a surplus for export (presumably primarily from existing fields). The third goal is to intensify exploration for new fields. In fiscal 1966, 16 wells were drilled for the total of 77,633 feet. Of the 72 wells planned for fiscal 1967, 55 had been completed as of August 1967. Accounts of the new plan stated that no foreign assistance will be used, although meanwhile Rumanian and Japanese advisers had been employed.

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The Mineral Industry of Canada

By Lester G. Morrell [1]

The dynamic growth of Canada's mineral industry continued through 1967 with value of output reaching a new high estimated at $4,069 million,[2] 10.7 percent above that of 1966. According to Dominion Bureau of Statistics national economic indicators, the value of minerals produced in 1967 represented 7.1 percent of the $57,200 million gross national product (GNP) and contributed 9.3 percent of the net national income. The rapid rise of minerals in the industrial pattern is reflected in production volume indexes related to the 1949 base. In 1967, the national product volume index for industry was 231.6; the mining product index for the same period was 419.1. Comparable figures for manufacturing and agriculture were 250.0 and 154.1, respectively. Salaries and wages paid to mining industry workers in 1967 amounted to $752 million, approximately 2.5 percent of the total labor income.

Metallic minerals, which normally account for about half the total value of Canada's mineral products, recorded an increase of $235 million, 12.8 percent higher than in 1966. The 1967 gains in nonmetallic minerals (including construction materials) amounted to 5.5 percent. Fuels, including oil and gas, were up 11.0 percent. Category percentages and total value of minerals produced in selected recent years were as follows:

Year	Share of total value (percent)			Total value (million U.S. dollars)
	Metals	Non-metals	Mineral fuels	
1963	49.5	20.7	29.8	$2,822
1964	50.2	20.3	29.5	3,134
1965	51.0	20.3	28.7	3,465
1966	50.0	21.1	28.9	3,675
1967 p	50.9	20.1	29.0	4,069

p Preliminary.

Canada's per capita output of minerals is one of the highest in the world. The total value of domestic crude mineral production is surpassed only by United States and the Soviet Union. Ores, concentrates, and semiprocessed mineral products, worth about $3 billion, were exported to more than 80 countries and constituted a significant share of the raw materials consumed by the industrial complexes of the United States, the United Kingdom, the European Economic Community, and Japan.

The Canadian mineral industry is founded on a diverse infrastructure of more than 60 primary products. In 1967 about half of this number contributed individual output valued in excess of $10 million. The 10 leaders, which made up over 80 percent of the total, were petroleum, $820 million; copper, $540 million; nickel, $432 million; iron ore, $421 million; zinc, $291 million; natural gas and byproducts, $284 million; asbestos, $151 million; sand and gravel, $146 million; cement, $135 million; and gold, $103 million.

The Provinces of Ontario, Alberta, and Quebec, with 27.1 percent, 22.7 percent, and 16.7 percent, respectively, accounted for about two-thirds of the value of minerals produced in 1967. Saskatchewan produced 8.4 percent, British Columbia 8.2 percent, Newfoundland (including Labrador) 5.9 percent, and Manitoba 4.2 percent. The three Maritime Provinces and two Territories together contributed 6.8 percent. Full production from the Texas Gulf Sulphur Company's new copper-zinc mine at Kidd Creek and increased output from the nickel-copper mines of Sudbury were primarily credited with Ontario's production value increase of $217 million in 1967. Alberta recorded a $139 million annual increase as a result of higher yields

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[2] Values have been converted from Canadian dollars (Can$) to U.S. dollars at the rate of Can$1 equals US$0.925.

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ot petroleum, construction materials, natural gas, and sulfur. Smaller annual increases were recorded in British Columbia, Saskatchewan, Newfoundland, and Manitoba. In 1967, the closing of two gold mines and lower output of copper and zinc resulted in a $25 million drop in value of Quebec's mineral production.

General wholesale price indexes for minerals and metals categories in 1967 and 1966 (the latter in parentheses) compared with 1935–39 prices were as follows: Nonferrous metals, 240.2 (212.7); iron products, 274.4 (268.0); nonmetallic minerals, 199.2 (193.7); chemical products, 212.6 (209.5). The average hourly earnings of a mining industry employee was $2.75 in December 1967, compared with $2.54 for the same month in 1966. Profits, before taxes, reported by mining, quarrying, and petroleum producing companies totaled $524 million in 1967 ($527 million in 1966). Capital expenditures for new construction and equipment by Canada's minerals and mineral processing industries in 1967 are expected to total about $1,047 million, exceeding the record $1,033 million set in 1966. As in previous years, the principal recipient was the petroleum and natural gas industry which absorbed nearly $470 million in 1967. In addition, manufacturing based on mineral products, expenditures on pipelines, and marketing petroleum and natural gas accounted for a further $740 million each year. Thus the minerals industry has been taking about 12 percent of the $14 billion total annual capital investment in Canada.

Dividends paid to shareholders in Canadian mines, exclusive of petroleum companies, totaled $315 million in 1967 to establish a new record. Nonferrous base metal producers (24 companies) accounted for $137 million. The four nickel companies paid $101 million, three iron ore producers paid $25 million, and 16 gold mines paid $13 million. Among the largest dividend payers were International Nickel, $82 million; Cominco, $26 million; Pine Point Mines, $21 million; Noranda, $20 million; Iron Ore Company of Canada, $18 million; Falconbridge Nickel Mines Ltd., $16 million; and Lake Dufault Mines Ltd., $15 million.

Exploration and mine development by government and industry continued at a high level in 1966, but subsided moderately during 1967 following publication of the Report of the Royal Commission on Taxation in February. In addition to numerous company, individual, and Provincial Government activities, The Geological Survey of Canada sent 99 parties to areas distributed across the Dominion during 1967. Principal fields of investigation included copper in north-central Newfoundland and on the Gaspé Peninsula of Quebec, several uranium and copper areas of Ontario, and nickel-copper deposits in Manitoba and Saskatchewan. Exploration was at a high level on molybdenum and copper prospects in British Columbia and in the lead-zinc-silver areas (Vangorda, Pelly Lake, Keno, and MacMillian Pass) in the Yukon. In the Northwest Territories, field teams were active in several localities, principally around Great Slave and Great Bear Lakes.

Although the great bulk of this activity has been on base metal prospects, there has been a recent revival of interest in uranium. After nearly 20 years of dormancy, the Cominco mercury mine at Pinchi Lake, British Columbia is being prepared to resume production in 1969.

More than 30 new mines were brought into production during 1966 and 1967. The Kidd Creek zinc-copper-lead mine of Texas Gulf Sulphur Co. near Timmins, Ontario, opened late in 1966 and the Great Canadian Oil Sands project near Fort McMurray, Alberta, was started in the summer of 1967. The new lead-zinc smelter of East Coast Smelting and Chemical Co., employing Canada's first Imperial Smelting Process furnace commenced treating Brunswick Mining & Smelting Corp. Ltd. concentrates early in 1967 at Belledune, New Brunswick.

Expansion continued with new capacity facilities scheduled to come on stream at more than 40 Canadian mines between 1967 and 1971.[3]

To reach the planned potash output level of 7.2 million tons per year by 1971 10 companies in southern Saskatchewan contemplated investments totaling $605 million. International Nickel Co. of Canada Ltd. and Falconbridge Nickel Mines Ltd. have embarked on programs of new mines and plant expansion that will cost more than $175 million. A dozen copper producers in British Columbia, Manitoba, Ontario, and Quebec plan increased annual metal out-

[3] Mine expansion costs on new high. Article in Engineering and Mining Journal. V. 169, No. 2 February 1968, pp. 83–111.

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put of about 165,000 tons requiring a total investment of approximately $185 million. Eleven companies classified as lead-zinc producers plan to increase national output of lead and zinc by 165,000 and 500,000 tons respectively, of new metal annually by 1969.

Several recent legislative events have been of significance to the minerals industry. Under provisions of the Government Organization Act, 1966, the Department of Mines and Technical Surveys was renamed the Department of Energy, Mines and Resources. Its functions were expanded to include responsibility for national policies and programs with respect to minerals, energy, water, and other resources. The Report of the Royal Commission on Taxation (Carter Commission), submitted to the Federal Government on February 24, 1967, called for fundamental changes in national taxation concepts. Few legislative proposals in recent years have generated prompter reaction and sharper criticism by the mining industry. Generally objectionable features were the suggested removal of the depletion allowance, and the 3-year tax exemption presently offered to new mines and imposing taxation on previously exempt prospector's gains. Deeper tax cuts into the earnings of both resident and nonresident shareholders were also anticipated.

A Federal Act to establish the Cape Breton Development Corporation, a Crown Company, was passed in June 1967. The company will acquire and manage the coal industry in the Sydney-Glace Bay area of Nova Scotia and promote and finance general industrial development on Cape Breton Island.

In November, following a test case between Ottawa and the Province of British Columbia, the question of Federal versus Provincial ownership of offshore mineral rights was resolved by a Supreme Court of Canada ruling in favor of the Federal Government.

An updated revision of Digest of Mineral Laws of Canada [4] was issued early in 1967.

[4] Hodgson, E.C. Digest of Mineral Laws of Canada. Dept. of Energy, Mines and Resources, Mineral Resources Division, Mineral Report 13, 1967.

PRODUCTION

Of the 60 mineral products listed in 1967 by the Dominion Bureau of Statistics, 25 are classified as metallics, 31 as nonmetallics, and four as fuel minerals. Annual gains in output were recorded in two-thirds of the metallics, about half of the nonmetallics, and all of the fuels. With the exception of zinc, prices generally were higher in 1967. Each of the categories recorded annual increases and set new highs in value.

Table 1.—Canada: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Aluminum	652,616	764,426	r 753,422	807,318	828,570
Antimony [1]	727	722	591	638	564
Arsenic, white	85	147	183	318	272
Bismuth [2]	163	181	194	238	246
Cadmium [3]	1,123	1,258	796	1,468	2,164
Calcium—kilograms	44,757	62,758	72,318	113,026	282,242
Cobalt [4]	1,372	1,444	1,655	1,593	1,499
Columbium concentrate (shipments)	1,334	1,883	2,060	2,301	1,925
Copper:					
Mine, recoverable	410,552	441,706	r 462,476	461,109	546,711
Smelter, refined	344,796	370,077	393,837	393,647	453,611
Gold—thousand troy ounces	4,003	r 3,835	r 3,606	3,319	2,953
Iron and steel:					
Iron ore—thousand tons	27,346	34,768	36,250	41,344	42,322
Pig iron and ferroalloys—do	5,496	r 6,093	r 6,587	6,714	6,449
Steel ingots and castings—do	r 7,436	8,283	r 9,134	9,074	8,795
Rolled steel—do	8,177	9,123	10,005	9,900	8,408
Lead:					
Mine, ore and concentrate, content	180,518	187,205	274,832	293,180	308,172
Refined, primary	140,614	137,322	169,175	167,711	172,618
Magnesium	8,080	8,485	9,170	6,099	7,879
Mercury—76-pound flasks	---	73	20	---	---

See footnotes at end of table.

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Table 1.—Canada: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals—Continued					
Molybdenum	378	556	4,335	9,262	9,764
Nickel [5]	196,885	207,287	242,496	202,855	224,033
Platinum and platinum-group metals troy ounces	357,651	376,238	463,127	396,059	403,270
Selenium kilograms	212,630	211,258	232,273	261,002	341,201
Silver thousand troy ounces	29,840	29,903	31,917	33,418	36,426
Tellurium kilograms	34,855	35,281	31,658	32,767	37,239
Thorium (ThO_2) do	35,171	44,403	21,019	39,641	53,246
Tin, mine long tons	414	157	168	317	237
Titanium slag (70–72 percent TiO_2)	344,115	494,164	495,248	476,067	546,539
Tungsten, concentrate (W content)	---	NA	1,334	1,506	NA
Uranium (U_3O_8)	7,576	6,609	4,031	3,412	3,405
Yttrium (Y_2O_3) kilograms	---	---	---	9,400	72,610
Zinc:					
Mine, ore and concentrate, content	451,032	662,186	826,377	949,790	1,133,054
Refined, primary	257,658	306,380	325,313	347,100	359,369
Nonmetals:					
Asbestos thousand tons	1,157	1,289	1,259	1,342	1,309
Barite	157,398	153,449	184,180	200,829	181,052
Cement [6] thousand tons	6,364	r 7,119	r 7,645	8,157	7,160
Clays and products [7] value, thousands	$35,293	$37,768	r $39,625	$39,734	$40,283
Diatomite	724	1,037	74	64	NA
Feldspar (shipments)	7,809	8,300	9,892	9,910	9,575
Fluorspar [8]	77,000	87,000	102,000	72,000	80,000
Gypsum and anhydrite thousand tons	r 5,402	5,770	5,720	5,421	4,466
Lime do	1,316	1,398	1,470	1,403	1,264
Lithium concentrate (Li_2O) [8]	292	479	460	115	257
Magnesite and brucite value, thousands	$3,182	$3,302	$3,710	$3,652	$3,183
Mica (shipments)	536	544	248	247	---
Nepheline syenite	230,424	263,356	308,425	332,659	368,585
Potash (K_2O equivalent)	568,675	778,679	1,352,878	1,805,386	2,207,169
Pyrite and pyrrhotite	432,215	319,191	320,060	296,606	340,546
Salt thousand tons	r 3,377	3,613	4,159	4,075	4,855
Sand and gravel do	159,404	161,900	186,208	197,075	201,306
Sodium sulfate	233,067	302,331	313,403	367,693	385,581
Stone:					
Crushed thousand tons	51,984	57,082	r 63,961	e 69,000	NA
Building and ornamental [9] do	177	245	r 186	e 193	NA
Sulfur [10] do	1,668	2,182	r 2,450	2,368	2,710
Talc, soapstone, and pyrophyllite (shipments)	49,215	52,736	47,933	63,634	53,887
Mineral fuels:					
Coal:					
Bituminous thousand tons	7,894	8,460	8,641	8,449	8,516
Lignite do	1,700	1,809	1,872	1,885	1,822
Coke, high-temperature do	3,883	3,940	3,963	4,015	4,019
Fuel briquets do	66	54	63	e 53	NA
Natural gas million cubic feet	1,111,478	r 1,327,664	r 1,442,448	1,341,833	1,465,372
Peat moss thousand tons	221	232	261	258	251
Petroleum:					
Crude thousand 42-gallon barrels	r 257,662	274,626	r 296,419	320,467	352,526
Refinery products:					
Gasoline, total do	119,608	124,988	128,652	136,369	141,962
Kerosine and jet fuels do	26,288	25,414	25,379	26,198	27,560
Distillate fuel oil do	93,900	94,139	99,653	107,770	106,230
Residual fuel oil do	45,312	47,635	47,730	51,821	54,598
Lubricants do	1,838	1,816	1,832	1,735	2,028
Other products do	23,606	27,123	28,342	31,820	32,600
Refinery fuel and loss do	20,962	21,266	23,468	25,626	25,390
Total do	331,514	342,381	355,056	381,339	390,375

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Antimony content of antimonial lead alloys, flue dust, and dore slag.

[2] Refined metal and bullion plus recoverable bismuth content of concentrates exported.

[3] Refined metal from domestic ores plus cadmium content of some exported ores and concentrates.

[4] All forms; excludes the cobalt in nickel sinter shipped to the United Kingdom by International Nickel Co., but includes cobalt in Falconbridge nickel-copper matte to Norway.

[5] Refined nickel and nickel in produced oxide and recoverable nickel in exported matte.

[6] Cement shipped or used by producers.

[7] Value including bentonite and products from common, stoneware, fire clay, and other types of clay.

[8] Spodumene concentrates.

[9] Building, ornamental, paving, and similar uses of granite, limestone, marble, slate, and sandstone.

[10] Includes sulfur from natural gas and from pyrite, pyrrhotite, and smelting of sulfide ores.

NOTE.—Table excludes the following items that were produced but not recorded in official statistics: abrasives, lightweight aggregates, carbon black, indium, mineral pigments, roofing granules, vanadium oxide, helium.

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TRADE

In 1967, mineral commodity exports valued at $3.05 billion accounted for nearly 30 percent of Canada's total exports valued at $10.28 billion. Crude materials made up slightly more than half the value of mineral commodity exports. By categories, nonferrous metals accounted for $1,530 million, ferrous metals, $570 million; nonmetallics, $370 million; fuels, $515 million. Although the 1967 values of both mineral and total exports represent new highs, the relative importance of minerals has fallen since the 1960 peak year when minerals exports comprised 34.5 percent of the total. This mainly reflected growth in the export of manufactured goods. Although the market for Canadian mineral products is worldwide, more than 80 percent has traditionally gone to the United States, the United Kingdom, and countries of the European Economic Community. Within the past few years Japan has assumed an increasingly prominent role in the export pattern, particularly for products of the western provinces.

Total merchandise imports in 1967 were valued at $10.25 billion. Of the total, $7.42 billion was from the United States. Mineral commodity imports in 1967 totaled $1.40 billion, less than half the value of similar exports. Leading import items were rolled steel products ($188 million) and coal ($129 million), both of which were virtually all from the United States. Most of the crude petroleum ($329 million) came from Venezuela. By categories, metallic materials valued at $648 million, and mineral fuels, valued at $666 million, accounted for over 94 percent of Canada's mineral commodity imports.

Table 2.—Canada: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Alumina, Al content	7,048	11,843	United States 11,539; Spain 200.
Scrap	35,304	41,522	United States 26,235; Italy 11,735.
Pigs, ingots, wire bars, etc	641,850	649,890	United States 346,677; United Kingdom 131,630; Japan 29,099.
Bars, rods, sheets, castings	23,969	30,959	United States 10,924; India 5,517; United Kingdom 3,381.
Foil	395	266	United States 100; New Zealand 50; United Kingdom 50.
Fabricated materials, n.e.s	10,543	11,193	Mexico 2,869; United States 1,719; Pakistan 1,648.
Cadmium	619	913	United Kingdom 541; United States 347.
Calcium metal—kilograms	67,268	110,132	United States 75,069; Belgium-Luxembourg 20,049.
Cobalt:			
Metal	133	285	United States 272.
Oxides and salts, gross weight	641	593	United Kingdom 574.
Columbium concentrate [1]—kilograms	843,824	691,400	All to United States.
Copper:			
Ore and matte, metal content	78,926	86,081	Japan 51,216; Norway 15,070; United States 8,832.
Scrap, slag, sludge	18,650	27,023	United States 20,874 West Germany 1,613.
Refinery shapes	181,285	172,992	United Kingdom 83,353; United States 77,093.
Semimanufactures:			
Bars, rods, shapes, etc	31,971	26,924	Norway 9,021; United States 6,364.
Pipe and tubing	7,594	15,126	United States 10,455; New Zealand 1,417.
Wire and cable	2,416	2,791	United States 2,564; New Zealand 44.
Iron and steel:			
Iron ore—thousand tons	31,293	31,186	United States 24,671; United Kingdom 2,257.
Pig iron—do	525	460	United States 401; United Kingdom 31.
Ferroalloys:			
Ferrochrome	186	32	All to United Kingdom.
Ferromanganese	3,463	5,191	All to United States.
Ferrosilicon	42,118	34,494	United Kingdom 21,261; United States 12,482.

See footnotes at end of table.

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Table 2.—Canada: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Iron and Steel—Continued			
Ferroalloys—Continued			
Other (type not specified)	1,681	5,409	West Germany 2,915; United States 2,217.
Steel:			
Ingots and other primary forms, thousand tons	276	200	United States 173; Spain 19.
Hot and cold rolled products, do	537	602	United States 377; Mexico 67.
Pipes and tubes, iron and steel, do	65	88	United States 58; Nigeria 14.
Lead:			
Ore and concentrate, metal content	97,037	102,452	United States 50,888; Belgium-Luxembourg 29,940; Japan 11,907.
Pigs, blocks, shot	117,087	96,586	United Kingdom 39,050; United States 32,935; Netherlands 9,262.
Alloys, scrap, metal, n.e.s	9,565	5,990	United States 4,680; Yugoslavia 684.
Magnesium [e]	6,520	5,494	United States 1,805; United Kingdom 1,514; West Germany 1,421.
Nickel:			
Ore, matte, and speiss, metal content	74,687	75,828	United Kingdom 40,246; Norway 33,717.
Scrap	949	1,073	United States 833; United Kingdom 86.
Oxide, metal content	37,155	30,509	United States 17,174; United Kingdom 4,471.
Ingots and other refined forms	122,650	120,395	United States 92,261; United Kingdom 18,368.
Fabricated products, n.e.s	2,885	3,517	United States 3,126.
Platinum-group metals:			
Concentrate, residues and matte, content, troy ounces	492,501	431,723	United Kingdom 423,882; Norway 7,841.
Scrap, do	26,815	32,406	United Kingdom 18,743; United States 13,663.
Metals, do	53,450	7,604	United Kingdom 6,428; United States 1,131.
Selenium metals and salts, selenium content, kilograms	204,663	266,757	United Kingdom 123,513; United States 120,837.
Silver:			
Ore and concentrate, metal content, thousand troy ounces	12,246	11,850	United States 8,147; Belgium-Luxembourg 2,098.
Refined metal, do	11,268	12,221	United States 12,094.
Tin, ore and concentrate, long tons	216	337	Mexico 186; United Kingdom 120; United States 31.
Titanium slag, 70 percent TiO_2 [1]	54,217	115,651	All to United States.
Uranium (U_3O_8) [1]	r 650	653	Do.
Zinc:			
Ore and concentrate, metal content	442,207	536,438	United States 282,993; Belgium-Luxembourg 147,182.
Blocks, pigs, slabs	239,680	232,378	United States 105,215; United Kingdom 96,388.
Alloys, scrap, dross, etc	8,295	9,039	United States 6,673; Belgium-Luxembourg 1,848.
Fabricated materials, n.e.s	1,533	1,752	United States 1,156; United Kingdom 438.
Nonmetals:			
Abrasives:			
Fused alumina, crude and grains	160,833	178,570	United States 169,354; United Kingdom 9,216.
Silicon carbide, crude and grains	82,466	89,701	United States 89,664.
Asbestos:			
Crude	112	156	Japan 64, United States 59.
Milled fiber, all grades, thousand tons	1,197	1,312	United States 593; United Kingdom 119.
Barite, crude	167,857	180,578	United States 172,159; Trinidad and Tobago 8,418.
Bentonite, earths and clays [1]	4,519	NA	
Cement, portland	303,808	369,583	United States 369,325.
Clay and clay products, value, thousands	$8,092	$9,245	United States $7,075; Puerto Rico $302.
Feldspar	3,398	3,106	All to United States.
Fluorspar, value	$8,857	$5,550	All to United Kingdom.
Gypsum, crude, thousand tons	4,306	4,239	All to United States.
Lime	217,122	164,077	United States 160,500.

See footnotes at end of table.

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Table 2.—Canada: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals—Continued			
Limestone, crude, crushed, and refuse	1,146,442	1,225,188	United States 1,219,092.
Nepheline syenite	224,255	239,154	United States 219,724; United Kingdom 5,727.
Potash materials [1]	1,364,050	1,854,677	All to United States.
Salt [e]	906,500	670,400	Mainly to United States.
Sand and gravel	624,086	635,257	United States 635,090.
Silica, quartzite	101,181	141,555	All to United States.
Sodium sulfate	105,547	92,004	Do.
Stone, rough building and crude, n.e.s.	201,966	201,200	United States 194,320; St. Pierre and Miquelon 4,684.
Sulfur, crude and refined	1,358,908	1,269,232	United States 712,763; Australia 178,125.
Talc and soapstone [1]	2,850	3,259	All to United States.
Mineral fuels:			
Briquets, coal and coke	6,731	22,370	All to United States.
Coal, bituminous	1,112,197	1,114,761	Japan 961,159; United States 151,633.
Coke, all types (except briquets)	80,405	79,487	All to United States.
Natural gas—million cubic feet	403,909	426,224	Do.
Petroleum:			
Crude—thousand 42-gallon barrels	108,010	123.691	Do.
Refined products:			
Gasoline, total—do	255	432	United States 426.
Distillate fuel oil—do	266	346	United States 202; St. Pierre and Miquelon 144.
Residual fuel oil—do	1,776	2,048	All to United States.
Lubricants—do	34	42	United States 34; St. Pierre and Miquelon 3.
Liquefied gases—do	7,855	10,323	United States 10,051.
Other petroleum and coal products, n.e.s.	value, thousands $2,977	$2,874	Mainly to United States.

[e] Estimate. [r] Revised. NA Not available.
[1] Data are from United States import statistics.

Table 3.—Canada: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	1,857,094	2,290,347	Guyana 1,322,001; Surinam 659,009; Malaysia 293,512.
Alumina	725,734	732,858	Jamaica 417,098; United States 166,696; Guyana 118,491.
Scrap aluminum and alloys	30,135	21,234	United States 21,180.
Pigs, ingots, shot, slabs, etc	6,300	15,353	United States 8,497; Norway 4,891; United Kingdom 1,652.
Semimanufactured products	42,909	55,681	United States 50,801; United Kingdom 2,120.
Pipe, tubes, wire, cable	797	882	United States 808; United Kingdom 66.
Manufactured materials.	value, thousands $3,362	$8,726	United States $7,764 United Kingdom $410.
Antimony oxide and salts, metal content.	279	337	United Kingdom 258; United States 41.
Chromium ore and concentrate, metal content.	32,122	13,942	United States 7,664; Philippines 5,846; Southern Rhodesia 2,779.
Copper:			
Ore, concentrate, and scrap, copper content.	2,141	2,301	United States 2,205.
Blocks, pigs, ingots	5,213	9,518	United States 9,514.
Bars, rods, sheet, tubes, etc	3,885	1,976	United States 1,019; United Kingdom 760.
Wire	255	150	United States 138.
Oxide and sulfate	163	384	United States 309; United Kingdom 66.
Alloys, primary and semimanufactured forms.	8,809	4,571	United States 2,374; United Kingdom 1,853.

See footnotes at end of table.

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Table 3.—Canada: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Iron and steel:			
Iron ore—thousand tons	4,839	4,392	United States 4,000; Brazil 333.
Scrap iron and steel	926,048	651,099	United States 650,037.
Pig iron	30,367	29,443	U.S.S.R. 16,952; Finland 12,149.
Ferroalloys:			
Ferrochrome	13,913	11,372	Republic of South Africa 4,566; France 3,787; United States 2,281.
Ferromanganese	31,354	44,559	Republic of South Africa 43,380; United States 939.
Silicomanganese	714	1,752	Republic of South Africa 1,626; United States 126.
Ferromolybdenum	181	NA	
Ferrosilicon	5,679	5,331	United States 4,414; Republic of South Africa 666.
Ferrotungsten	161	87	United Kingdom 70; Austria 14.
Ferrovanadium	295	434	United States 344; United Kingdom 44.
Other	2,425	2,061	United States 2,020.
Steel ingots and equivalent primary forms.	26,857	34,359	United States 19,897; West Germany 12,474.
Iron and steel products:			
Castings and forgings	48,177	95,931	United States 92,687.
Rolled, steel, including structurals and rails.	1,490,880	1,110,516	United States 309,029; West Germany 201,818; Belgium-Luxembourg 180,578; Japan 139,780.
Pipe, tubes, wire, cable	220,287	251,012	United States 83,611; Japan 75,637; United Kingdom 46,026.
Lead:			
Primary and fabricated forms	298	774	United States 431; Netherlands 200; United Kingdom 142.
Oxide	1,075	1,864	United States 592; Mexico 480; United Kingdom 342.
Manganese:			
Ore and concentrate, manganese content.	81,176	167,015	Ghana 85,402; Brazil 33,338.
Metallic manganese	2,907	2,414	United States 1,373; Republic of South Africa 692.
Magnesium metal	1,489	2,731	United States 1,726; U.S.S.R. 1,000.
Mercury—76-pound flasks	14,091	5,324	Mexico 1,338; United States 1,308; Spain 911; Peru 616.
Molybdenum: Molybdic oxide, gross weight.	345	302	All from United States.
Nickel, unwrought and semimanufactured, including alloys.	13,653	28,709	United States 18,639; Norway 9,788.
Platinum and group metals. troy ounces	233,603	197,853	United Kingdom 192,861.
Silver—thousand troy ounces	13,413	14,478	United States 14,452.
Sodium metal	4,277	6,855	United States 6,853.
Tin: Blocks, pigs, bars—long tons	4,993	4,322	Malaysia 3,101; United States 783.
Titanium:			
Dioxide, pure and extended	10,069	10,343	United States 9,611; United Kingdom 600.
Metallic titanium	729	1,288	United States 1,249.
Tungsten, in ore and concentrate	162	238	Mainland China 117; United States 67; Bolivia 37.
Zinc:			
Pigs, slabs, blocks, anodes	15	114	United Kingdom 101; United States 13.
Bars, plates, sheets, disks, shells	1,242	999	United States 935; West Germany 34.
Fabricated materials	1,007	862	United States 829.
Dust and granules	1,217	1,181	United States 880; Belgium-Luxembourg 300.
Nonmetals:			
Barite, ground	3,344	3,778	United States 3,668.
Bentonite, clay and drilling mud	165,256	174,371	All from United States.
Cement, all types	34,128	45,918	United States 17,426; United Kingdom 12,401; Belgium-Luxembourg 6,410.
Clays, ground or unground	315,163	301,463	United States 236,666; United Kingdom 64,773.
Cryolite, natural	2,196	3,312	Denmark 3,012; United States 300.

See footnotes at end of table.

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Table 3.—Canada: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Diamond:			
Unset—thousand carats	70	68	Belgium-Luxembourg 38; Israel 16.
Industrial—do	1,097	1,167	United States 710; Belgium-Luxembourg 251.
Dust—do	189	232	United States 222.
Diatomaceous earth	22,760	26,508	All from United States.
Fluorspar	63,365	68,332	Mexico 54,691; United States 10,345.
Fuller's earth	6,223	6,915	All from United States.
Gypsum, crude	68,431	77,939	Mexico 77,110.
Lime	22,982	26,534	United States 26,449.
Magnesium compounds:			
Dolomite, calcined	26,995	15,628	All from United States.
Magnesia, dead burned	32,677	31,586	United States 19,618; Yugoslavia 6,564; Austria 3,749.
Mica, unmanufactured	2,725	2,889	United States 2,833.
Phosphate rock—thousand tons	1,538	1,979	United States 1,885.
Phosphate fertilizers	129,905	105,347	All from United States.
Potash products, fertilizers	73,897	60,475	United States 29,808; France 14,069; West Germany 13,411.
Salt and brine	400,612	462,252	Mexico 200,343; United States 158,424; Bahamas 69,313.
Sand and gravel—thousand tons	518	514	Mainly from United States.
Silica sand—do	757	919	United States 910.
Sodium sulfate and Glauber's salt	26,624	28,360	United States 20,748; United Kingdom 7,098.
Stone, crushed, including stone refuse.—thousand tons	1,355	1,308	United States 1,304.
Stone, cut (granite, marble, slate, and other).	24,536	26,516	United States 20,668; Republic of South Africa 2,266.
Sulfur, elemental	147,146	131,963	United States 131,918.
Talc and soapstone	25,272	22,065	United States 21,687.
Vermiculite, crude	25,886	26,153	United States 23,758; Republic of South Africa 2,395.
Mineral fuels:			
Asphalt and bituminous materials, crude.—value, thousands	$368	$437	United States $402.
Coal:			
Anthracite—thousand tons	581	539	All from United States.
Bituminous and subbituminous.—do	14,473	14,372	Do.
Briquets, coal and coke	7,198	5,972	Do.
Coke, all types (except briquets).—thousand tons	892	983	Do.
Natural gas—million cubic feet	15,673	43,551	Do.
Petroleum:			
Crude—thousand 42-gallon barrels	144,184	146,077	Venezuela 71,840; Iran 21,567; Saudi Arabia 15,965.
Refinery products:			
Gasoline, total—do	3,108	2,791	Netherlands Antilles 1,152; Panama 682; Venezuela 555.
Kerosine and jet fuel—do	4,587	4,419	Netherlands Antilles 2,087; Venezuela 1,062; United Kingdom 792.
Distillate fuel oil—do	15,915	14,844	Venezuela 10,310; Netherlands Antilles 2,860.
Residual fuel oil—do	31,028	30,471	Netherlands Antilles 11,966; Venezuela 10,097; United States 4,717.
Lubricants—do	1,658	1,871	Mainly from United States.
Liquefied petroleum gases.—do	100	84	Do.
Other refinery products.—do	2,289	478	Do.
Other petroleum and coal products.—value, thousands	$5,929	$9,333	United States $7,533 United Kingdom $1,645.

• Estimate. NA Not available.

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COMMODITY REVIEW

METALS

Aluminum.—Despite voluntary curtailments by Aluminum Company of Canada Ltd. and a strike at the Canadian British Aluminium Company Ltd. plant, primary aluminum production set a record in 1967. Shipments to domestic consumers were estimated at 168,000 tons, down slightly from the 1966 figure. Exports totaled 690,000 tons in 1967, compared with 650,000 tons in 1966.

Completion early in 1967 of the major portion of modernization and expansion projects at Aluminum Company of Canada's five smelters resulted in record company output of 796,000 tons. This represents 92 percent of the new total capacity. To avoid excessive stock inventories, operating rates were reduced in June and August to 87.5 percent of capacity. In addition the parent company Alcan Aluminium Ltd. (Alcan) has greatly intensified activities abroad. Smelters of Alcan subsidiaries and affiliates in Norway, Sweden, Brazil, India, and Japan produced 473,000 tons of new metal in 1967 and mines in Jamaica and Guyana supplied 1,100,000 tons of alumina and 900,000 tons of bauxite, much of which came to Canada. In Australia, Alcan holds a 20-percent interest in the new plant of Queensland Alumina Ltd. and will bring the Alcan Australia Ltd. (wholly owned) smelter into operation at 30,000 tons per year in 1969.

The Canadian British Aluminium Company Ltd. smelter at Baie Comeau, Quebec, reported production of 79,550 tons in the company's financial year ending July 31, 1967, compared with 92,600 tons in 1966. A strike shutdown on May 16 resulted in frozen potlines and lack of production through the final months of the fiscal period. Expansion of facilities underway will raise annual plant capacity from 98,000 to 105,000 tons by early 1968. When the third potline is completed in 1970 or 1971, production should be about 160,000 tons.

Canadian consumption of primary and secondary metal was 220,500 tons in 1966, compared with 193,315 and 156,438 in 1965 and 1964, respectively. Consumption in 1967 approximately equaled that of 1966.

Copper.—With the addition of six new sources, bringing the total to more than 70 mines, Canada's 1967 copper production reached a record high, nearly 20 percent above that of 1966. The industry was stimulated by the prolonged U.S. copper strike and the price increase to Canadian producers, from 42.5 cents (U.S.) at the beginning of 1967, to 47.5 cents through November and December. Exploration resulted in the discovery of several new ore bodies, and development at many known deposits substantially increased reserves. Sixteen new mines will join the list of Canadian copper producers by 1971.[5] Longer range projections call for an increase in annual output of 270,000 tons of new metal by 1973.

Mines in Ontario accounted for 46 percent of the copper produced in 1967. The great bulk of Ontario's increase reflects the first full year's output of the Ecstall Mining Ltd.[6] Kidd Creek open pit zinc-copper mine near Timmins. The first 2,700-ton-per-day section of the mill, at Hoyle, went into service in November 1966. The milling rate was increased to 8,200 tons per day early in 1967. At this rate, annual recovery of copper in concentrates approximates 45,000 tons per year, all of which is shipped to the Noranda smelter.

In British Columbia, mine copper output increased from 48,000 tons in 1966 to nearly 75,000 tons in 1967, as three new mines commenced production: Granisle Copper Ltd., Minoca Mines Ltd., and Western Mines Ltd. As with all British Columbia copper producers except the Anaconda Company mine at Britannia Beach, the output of the new mines was exported to Japan in the form of concentrates. Three more operations are scheduled to start production by 1969: Brenda Mines Ltd. at Peachland, Falconbridge Nickel Mines Ltd. Wesfrob mine in the Queen Charlotte Islands, and Granduc Mines Ltd. on the Unuk River.

The blister and matte products of the six copper and copper-nickel smelters in Canada, with the exception of Falconbridge products exported for processing in

[5] Department of Energy, Mines and Resources, Mineral Resources Division. The Canadian Mineral Industry in 1967–Preliminary. Min. Inf. Bull. MR 90, 1968, p. 33.

[6] Wholly owned subsidiary of Texas Gulf Sulphur Co. Inc., of the United States.

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Norway, continued to be refined at the Canadian Copper Refiners Ltd. plant near Montreal, Quebec, and the International Nickel Company of Canada Ltd. plant at Copper Cliff, Ontario. Their output totaled 453,611 tons in 1967, compared with 393,647 tons in 1966. Refined copper exports in 1967 totaled 250,309 tons, including 133,447 to the United States and 85,281 to the United Kingdom. Shipments to domestic consumers were 203,570 tons in 1967 and 238,188 in 1966. Canadian manufactures in 1965 (1964 in parentheses) consumed the following tonnages of copper products: Copper rolled products including pipe, tube, etc., 57,146 (57,222); brass rolled products including pipe, tube, etc., 10,232 (9,389); wire and rod mill products, 103,914 (99,313); and miscellaneous other products, 1,740 (1,945).

Gold.—Canada's gold production fell below 3 million ounces in 1967, the lowest since 1946. For the past 8 years, casualties among gold mines resulting from exhaustion of ore reserve and/or loss of marginal reserves due to rising costs have averaged about six per year. From the peak period around 1941, when 146 produced 5.3 million ounces, the number of producers had fallen to 33 at yearend 1967. Among the seven mines that suspended operation in 1966 and the five in 1967 were six long-time producers: Tech-Hughes Gold Mines Ltd., McKenzie Red Lake Gold Mines Ltd., Porcupine Paymaster Ltd., Pickle-Crow Gold Mines Ltd., all in Ontario; Sullivan Consolidated Mines Ltd., in Quebec; and Cariboo Gold Quartz Mining Co. Ltd., in British Columbia. Canada's largest producer of placer gold, Yukon Consolidated Gold Corp. Ltd., also ceased operation late in 1966.

Thirty-eight lode gold producers—10 in Quebec, 20 in Ontario, and 8 in the western provinces and territories—accounted for nearly 82 percent of the year's output. About 18 percent was recovered as a byproduct of base metal ores, and 0.3 percent was from placer operations. The largest individual producer was Giant Yellowknife Mines Ltd., in the Northwest Territories (226,696 ounces). Despite its imminent closure, set for March 1968, due to exhausted reserves, the second largest producer was Hollinger Consolidated Gold Mines Ltd., at Timmins, Ontario (191,866 ounces). Others in Ontario were Kerr Addison Mines Ltd. (188,459 ounces), Dome Mines Ltd. (178,988 ounces), and Campbell Red Lake Mines Ltd. (170,359 ounces).

The average price per ounce to Canadian producers during 1967 was Can$37.75, compared with $37.71 in 1966. The current Gold Mining Assistance Act expired on December 31, 1967, but it was promptly extended, without material change, through 1970. Payment to 38 mines amounted to Can$13,142,842 in 1966, bringing the total cost since this assistance began in 1948 to Can$231 million. Only three of the 33 mines operating at the close of 1967, will not receive cost assistance: Campbell Red Lake Mines Ltd., Giant Yellowknife Mines Ltd., and Rycon Mines Ltd.

Iron Ore, Pig Iron, and Steel.—Iron ore production continued to expand in 1966 and 1967 but the steel industry output, responding to a somewhat lower domestic demand, fell below the 1965 peak in both years. Following the established pattern, foreign markets took about three-fourths of the mine output of iron ore. Shipments to United States amounted to 23.9 million tons in 1967 (24.7 million in 1966). The United Kingdom again took about 3 million tons and Italy, Japan, the Netherlands, and other countries received smaller quantities.

The Canadian iron ore industry included 20 companies producing direct shipping ores, concentrates, and pellets and four recovering relatively small quantities of iron byproducts from base metal and titanium ores. Nearly 75 percent of the nation's iron ore is mined by three large companies in the Quebec-Labrador (Newfoundland) area of eastern Canada. Eight other companies, including two byproduct producers in Ontario, contributed 20 percent of the total in 1967. British Columbia's 5 percent of the total production was from the several small mines on Vancouver Island, the new producer on Queen Charlotte Island, and the Consolidated Mining and Smelting Co. sinter byproduct plant.

At yearend 1967, iron ore production capacity was estimated at about 48 million tons, of which about half representated pellet production capacity. Ten pellet plants were in operation in Canada at yearend, including the newly completed

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plant of Dominion Foundries & Steel Ltd. at the Sherman Mine, Timagami, Ontario.

After over 70 years of continuous operation, DOSCO Industries Ltd. closed its Belle Island mine in Newfoundland in mid-1966 because of operational losses and the inability to compete. An expansion program initiated in 1966 by Iron Ore Company of Canada raised the annual capacity of its Carol pellet plant at Labrador City, Newfoundland, from 7 million to 10 million tons. Under a joint venture agreement signed in mid-1966, Steep Rock Iron Mines Ltd. and Algoma Steel Corp. Ltd. began increasing ore output and started construction of a pellet plant at Steep Rock Lake, Ontario. The plant, which has an annual capacity of 1.35 million tons, commenced operation in 1967. During the year, the Wesfrob Mines Ltd. copper and iron ore operation on the Queen Charlotte Islands in British Columbia was opened. This company's entire output of iron sinter and pellet concentrates, from plants rated at nearly 1 million tons annually, has been contracted to Japan for 10 years.

Capacity of the 16 blast furnaces and 11 electric furnaces that operated during 1967 was rated at 8.42 million tons. Steelmaking facilities, as of December 31, 1967, were rated 11.69 million tons; 11.24 million tons for ingots and 0.45 million tons for castings. The Department of Energy, Mines and Resources lists 18 companies producing pig iron and ingot steel, 11 producers of ferroalloys, and more than 30 additional companies making various types of castings.

Table 4.—Canada: Salient iron and steel statistics

(Thousand metric tons)

	1963	1964	1965	1966	1967
Blast furnace feed:					
Iron ore:					
From Canadian mines	697	770	499	568	899
Imported	1,618	1,192	1,317	976	672
Sinter, pellets, etc.:					
From Canadian mines	1,831	2,133	2,791	3,857	4,717
Imported	2,778	3,341	3,455	2,712	2,097
Made in iron and steel plants	1,535	1,648	1,555	1,614	1,344
Blast furnace output:					
Pig iron	5,366	5,933	6,409	6,543	6,296
Ferroalloys	130	151	165	170	152
Steel furnace feed:					
Pig iron	4,613	5,131	5,575	5,734	5,529
Scrap	3,688	4,200	4,751	4,548	4,507
Steel furnace output:					
Ingots	7,316	8,136	8,950	8,903	8,665
Castings	114	147	148	171	130
Total	7,430	8,283	9,098	9,074	8,795
Rolled steel products:					
Carbon steel:					
Hot rolled	5,725	6,264	6,872	6,735	5,690
Cold rolled and coated	2,265	2,595	2,798	2,807	2,355
Alloy steel	187	264	335	358	363
Total	8,177	9,123	10,005	9,900	8,408

A record high investment of $200 million by iron and steel companies in 1967 was largely in raw material supply facilities and improvements in existing works. Newfoundland Steel Company started its new 60,000-ton-per-year steel plant at Octagon Pond, Newfoundland, in August 1966. At Kimberly, British Columbia, also in 1966, Cominco Ltd. began steel production, using a pig iron byproduct from lead-zinc sulfide ores. The Cominco plant consists of an 18-ton basic oxygen furnace rated at 80,000 tons' annual capacity. Construction of large new blast furnaces was started in 1966 by The Steel Company of Canada Ltd. in Hamilton and at the Sault Ste. Marie works of Algoma Steel Corp. Ltd. Projects completed in 1967 included an additional electric furnace at Quebec Iron & Titanium Corp., Sorel, Quebec, which raised that plant's pig iron capacity 20 percent to about 500,000 tons per year; and new electric furnaces of 40- and 20-ton rating, respectively, by the Burlington

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Steel Company in Hamilton and the Canadian Steel Foundries in Montreal.

In October 1966, Hawker Siddeley of Canada Ltd. announced plans to close the DOSCO Steel Ltd. works at Sydney, Nova Scotia, early in 1968. The desision, which will affect some 3,000 employees, is attributed to inability to compete with foreign suppliers and excessive operational losses. The Government of Nova Scotia later agreed to purchase the plants at yearend 1967 and to continue operation on a subsidy basis until a solution to the problems can be developed. Siderurgie de Quebec (Sidbec) sponsored by the Provincial Government was negotiating for purchase of the DOSCO steel mills in the Province of Quebec.

Lead and Zinc.—Continuing the recent trend, production of both lead and zinc set new records in 1967. Mine production increased 5 and 19 percent respectively above the 1966 figures. Canada retained first place among world producers of zinc and third, after the U.S.S.R. and Australia, in mine production of lead. Official lists for 1967 name 22 Canadian lead producers and 38 zinc producers, but many of these mines produce both metals, frequently with coproduct copper and precious metals. All provinces and territories except Prince Edward Island contributed substantial quantities of lead and zinc. By percentage of total Canadian mine production, regional output of zinc and lead (the latter in parentheses) in 1967 was as follows: Maritime Provinces, 17.3 percent (21.8 percent); Quebec and Ontario, 47.5 percent (2.2 percent); Western Provinces 16.5 percent (33.1 percent); Yukon and Northwest Territories, 18.7 percent (42.9 percent).

The sudden rise in mine zinc production in 1967 was due largely to the full year of operation at Texas Gulf Sulphur Co.'s Ecstall Mining Ltd. open pit mine near Timmins, Ontario. The expanded mill capacity of 8,200 metric tons per day was brought into service in March 1967. Brunswick Mining & Smelting Corp. Ltd. also contributed a full year's output from its No. 6 mine that started in 1966. Under an agreement concluded in June 1967, Noranda Mines Ltd. assumed management of operations and will acquire a majority interest in Brunswick Mining & Smelting Corp. Ltd. In the Northwest Territories, Pine Point Mines Ltd., on Great Slave Lake, acquired the adjoining Pyramid Mining Company Ltd. claims and embarked on a mill expansion project that will raise daily ore input capacity from 4,500 to 7,300 tons.

Canada's zinc reduction capacity has been raised 20 percent in the past 2 years to 474,000 tons per year on December 31, 1967. In addition to substantial increases at the plants of Electrolytic Zinc Limited at Valleyfield, Quebec, and Cominco Ltd. at Trail, British Columbia, the East Coast Smelting and Chemical Co. Limited brought Canada's first Imperial Smelting Process furnace into operation early in 1967, at Belledune, New Brunswick. The new facility is designed for annual recovery of 47,000 tons of zinc, 44,000 tons of lead, 2.6 million ounces of silver, 23 tons of cadmium, and 220,000 tons of sulfuric acid.[7]

Until the East Coast Smelting and Chemical Co. entered the picture, Canada's entire output of refined lead was produced by Cominco Ltd. Production reported by that company was 170,158 tons in 1967, compared with 167,712 tons in 1966.

More than three-fourths of the mine output of lead and zinc was exported either in ore and concentrate or as primary metal. Lead exports in 1967 at 234,519 tons (114,481 tons in ores and concentrates and 120,038 tons refined metal) were about 18 percent higher than in 1966. Zinc exports totaling 937,445 tons (667,420 tons in ores and concentrates, 270,025 tons refined) were 22 percent higher than in 1966. The principal markets for both metals included The United States and The United Kingdom. Japan took large quantities of both metals, mostly in concentrate form.

Molybdenum.—Despite a fire in October that destroyed the Molybdenum Corporation of Canada Ltd. mill in Quebec, Canadian molybdenum production was at a record high in 1967. With the start of operation in November by British Columbia Molybdenum Ltd. near Alice Arm, British Columbia, nine companies, four in Quebec

[7] Brunswick Mining and Smelting Corporation Ltd. annual report for 1967 gives production data for the year as follows (in tons): Zinc, 10,470; lead, 5,273; silver-lead bullion, 62; sulfuric acid, 72,421.

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and five in British Columbia, contributed to production. Two of these, Gaspé Copper Mines Ltd. in Quebec and Bethlehem Copper Corp. Ltd. in British Columbia, recovered molybdenum as a byproduct; the others are all primarily molybdenum producers. Approximately 82 percent of the year's output was mined in British Columbia. By 1969, when byproduct recovery from the 20,000-ton-per-day open pit copper operation of Brenda Mines Limited is scheduled to commence and expansion projects take effect at several other properties, the British Columbia share and total Canadian output are expected to rise materially. Output in 1968 has been forecast at about 14,000 metric tons.[8]

Although a small quantity of molybdenum concentrate was converted to ferromolybdenum by Masterloy Products Ltd. near Ottawa, virtually all of the Canadian output has been exported. In 1967, 10,792 tons of molybdenum was exported in ores and concentrates; principal destinations were the United Kingdom (2,970 tons), Japan (2,639 tons), and the Netherlands (1,584 tons).

Nickel.—Canada's nickel production in 1967 was 10 percent above that of 1966, but approximately 18,500 tons below the peak output in 1965. Owing to the higher price, 101.5 cents (Canadian) per pound in 1967 compared with 84 cents in 1965, the total value of nickel produced in 1967 was considerably higher than in any previous year.

The past year's nickel production was from 22 mines owned by eight companies. The three fully integrated producers, International Nickel Company of Canada Ltd. (Inco), Falconbridge Nickel Mines Ltd., and Sherritt Gordon Mines Ltd., operated 11, five, and one mines, respectively, in Ontario and Manitoba. Independent shippers included two in Quebec, two in Ontario, and one in British Columbia. Exploration and development projects are underway at more than a dozen other properties, of which 10 are expected to begin production before 1971.

The major expansion being effected by Inco has involved capital expenditures of Can$219 million in 1966 and 1967 and will approach Can$200 million in 1968. The mine development program aims at eight new mines, five in Ontario and three in the Thompson area of Manitoba. By 1971 Inco expects to increase the company's annual production capacity by 45,000 to 65,000 tons of nickel with the planned new mill, smelter, and refinery facilities. In addition to its Canadian program, Inco is actively investigating nickel resources in Gautemala, New Caledonia, the British Solomon Islands, Indonesia, and Australia.

Falconbridge Nickel Mines Ltd. expenditures on mines and plants in 1967 totaled Can$42 million, compared with Can$26 million in 1966. The bulk of these funds have gone into preparation of the Strathcona mine and a 6,000-ton-per-day mill that was about ready to start operation at yearend 1967. By mid-1968, ore from the new Longvack South mine will also be treated in the Strathcona mill.

At yearend, production of nickel metal and ore reserves, as reported in annual statements of the three principal Canadian producers in 1966 and 1967 were as follows:

	1966	1967
Production (metric tons):		
Inco	226,889	210,220
Falconbridge	35,817	33,909
Sherritt-Gordon	13,391	11,376
Ore reserves (million metric tons):		
Inco	294.7	324.5
Falconbridge	50.5	50.5
Sherritt-Gordon	10.3	10.8

Domestic consumption of nickel in alloy steel manufacture, plating, coinage, and other products amounted to about 9,000 tons annually in 1966 and 1967. Exports of nickel in ore and semiprocessed metallurgical products, mostly to the United Kingdom and Norway, were at about the 76,000-ton level in both years. Refined nickel exports, the great bulk of which traditionally go to the United States, totaled 116,718 tons in 1967, compared with 120,395 in 1966.

Silver.—Reflecting additional byproduct recovery from the new nonferrous base metal mines, particularly that of Texas Gulf Sulphur Co. Ltd., Kidd Creek mine near Timmins, Ontario, Canadian production of silver set a new record in 1967, about 13 percent higher than in 1966. Moreover, the 7.8 million ounces reported

[8] Schneider, V. B., and G. P. Wigle. The Canadian Molybdenum Industry 1966. Dept. of Energy, Mines and Resources, Mineral Resources Division, Min. Inf. Bull. MR 83, 1967.

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for 1967 in concentrate from Kidd Creek probably ranks it as the world's largest silver mine. The output credited to Ontario was up 43 percent. While silver recoveries in most of the nine other producing provinces and territories remained at about the same level, curtailment of operations at United Keno Hill Mines Limited in the Yukon Territory resulted in a drop of 2.4 million ounces. In 1966, 35 companies accounted for the nation's silver production. Nonferrous base metal operations accounted for 83 percent of the year's total. Silver-cobalt and silver ores supplied 16 percent; about 1 percent of this total was from placer and lode gold ores.

Approximately two-thirds of the mine production of silver is refined in Canada by Canadian Copper Refiners Ltd., Cominco Ltd., The International Nickel Company of Canada Ltd., several other commercial plants, and the Royal Canadian Mint. Canadian consumption of refined silver in 1966, totaling 21.3 million ounces, was largely (15.5 million ounces) for coinage. In 1967, the mint suspended coinage of silver dollars and half-dollars. Beginning in 1968, 10-cent, 25-cent, and 50-cent coins will be made of nickel.

Exports of silver in nonferrous base metal ores and concentrates and of refined metal amounted to 10.4 million ounces and 13.7 million ounces, respectively, in 1967. Over 77 percent of the total went to the United States. However, recorded imports of 5.4 million ounces of refined silver from the United States in 1967 indicate that a part of the metal recovered from ores and concentrates has been returned to Canada.

Uranuim.—In contrast to the 1959 peak when 19 Canadian plants shipped 14,400 tons of uranium oxide (U_3O_8), the 1967 output of 3,400 tons was by three companies in the vicinity of Elliot Lake, Ontario, and one in Beaverlodge, Saskatchewan. Under the impetus of long-range market possibilities, interest in exploration and development revived early in 1966 and has continued through 1967. Staking of claims in all of the "open" areas adjacent to the established mines at Elliot Lake and Beaverlodge has been followed by renewed attention to prospects found during the late 1950's but left dormant. In 1966 and 1967, drilling by Agnew Lake Mines Ltd. (a subsidiary of Kerr Addison Mines, Ltd.) indicated a 10-million-ton ore body containing 16 million pounds U_3O_8 in Hyman Township, 40 miles east of Elliot Lake. The company was considering production by 1971. Intense interest has also been shown in the Wanapitei area, north of Sudbury. In Saskatchewan, Eldorado Mining and Refining Ltd. was developing a new mine at Uranium City, and uranium exploration activities have been reported in the areas of Lac LaRonge, Foster Lake, and Frobisher Lake in the northern half of the Province. Several areas in Quebec have come under investigation, such as the Johan Beetz and St. Simeon areas on the north shore of the St. Lawrence River and the Lake Mistassini area northeast of Chibougamau.

In addition to the many Canadian companies that have joined in the recent uranium search, the extent of foreign participation is noteworthy. Besides American Metal Climax, Inc., Newmont Mining Corp., Phelps Dodge Corp., Homestake Mining Co., and other U.S. companies, Compagnie de Mokta of France, four West German firms, and Mitsui Mining & Smelting Co. Ltd. of Japan have also acquired interests in developing Canada's uranium potential.

Under a Government policy announced in 1965, Canadian producers may negotiate their own sales contracts consistent with peaceful uses concepts. Two such contracts were negotiated in 1966: Rio Algom Mine Ltd., for delivery of 7,260 tons of U_3O_8 to the United Kingdom over an 8-year period beginning in 1973;[9] and Rio Algom and Eldorado Mining and Refining Ltd. jointly to supply 5,900 tons to Ontario Hydro-Electric Power Commission over 10 years beginning in 1970. In 1967, contracts were negotiated for Eldorado to deliver up to 910 tons to a West German utility, beginning probably in 1968 or 1969. Denison Mines Ltd., Rio Algom, and Eldorado, in three separate contracts, agreed to deliver 14,500 tons to a group of Japanese electrical utilities over 10 years beginning in 1969.

Although the Canadian Government has maintained a stockpile of uranium oxide, none was consumed in Canada until January 7, 1967, when the 200-megawatt Douglas Point Nuclear Power Station, near Kincardine, Ontario, started generation of electricity. A second Canadian nuclear

[9] This contract was subsequently expanded to an optional 10,430 tons.

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plant was being erected by Quebec Hydro Commission at Gentilly, on the south shore of the St. Lawrence River. In April, the Canadian Atomic Energy Control Board authorized the addition of two 540-megawatt units at the Ontario Hydro site at Pickering, Ontario.

NONMETALS

Asbestos.—Reflecting a leveling in consumer markets in both Canada and the United States, asbestos production in 1967 was slightly below the 1966 peak. Approximately 89 percent of the 1967 output was from 11 mines in southeastern Quebec, about 7 percent was from the two mines of Cassiar Asbestos Corp. Ltd. in British Columbia and the Yukon Territory, and 4 percent was from the Advocate Mines Ltd. mine at Baie Verte, Newfoundland.

Programs to increase production or improve fiber quality were continued throughout 1967 by several large producers in Quebec. Canadian Johns-Manville Co. Ltd. and Lake Asbestos of Quebec Ltd. were enlarging open pit operations. Bell Asbestos Mines Ltd., one of the few underground asbestos mines in Canada, was sinking a new shaft to open a second working level. A new mill will be built at the shaft.

The Yukon Territory became an asbestos producer in 1967 with the opening of the Cassiar Asbestos Corp. Ltd. mine and mill, designed for 55,000 tons per year, at Clinton Creek, 40 miles northwest of Dawson. Ontario, also a newcomer to Canadian asbestos, recorded a small output in both 1966 and 1967 from the pilot mill of Hedman Mines Ltd. at Matheson, near Timmins. In the same general area, the Reeves mine of Canadian Johns-Manville Co. Ltd. was scheduled to bring its new plant into production at 23,000 tons of fiber per year in 1968.

Virtually all of the asbestos produced in Canada is exported in milled and "shorts" forms to 70-odd countries. Of the 1.2 million tons exported in 1967, over 550,000 tons went to the United States.

Potash.—Canadian potash production, all from mines in southern Saskatchewan, rose 22 percent in 1967 to more than 2.2 million tons, in terms of K_2O equivalent. This ranks Canada in third place, after the United States and the U.S.S.R., for the year. Canada is expected to surpass both countries in 1968, and to dominate world production through the 1970–80 decade.

International Minerals & Chemical Corp. (Canada) Ltd. started its second plant at Gerald, near Esterhazy, in April 1967, which brings the number of Canadian producers to four. Expansion of established facilities continued at the Potash Company of America mine and treatment plant at Saskatoon and at the Kalium Chemicals Ltd. solution mining operation at Belle Plaine. Five additional producers, all engaged in mine preparation and plant construction programs during 1967, were scheduled to come on stream before 1970. A recent news item announced the startup of one of these, Allen Potash Mines, in mid-April 1968.

With an outlook of world oversupply for the next few years and heavy involvement by the United States and other foreign control of the Canadian producer companies, the industry was confronted with major marketing problems in 1967. Prices to Canadian producers fell by about 25 percent during the year, resulting in considerable controversy between producers and railroads regarding freight rates. In the U.S. Congress, legislation proposing import quotas has been introduced by representatives from New Mexico where potash mines face closure owing to Canadian competition. Canadian objections have been raised due to the prohibition of U.S.-controlled companies in Canada, to trade with Communist countries such as mainland China. At yearend, the Saskatchewan Government was considering measures to prorate output among the several producers.

Domestic consumption of potash for fertilizer manufacture has been estimated at 8 percent of the 1967 production level. Although quantities and destinations of exports are not reported, the United States imports of potash materials from Canada totaled 2.1 million tons in 1967. This indicates that the great bulk of Canadian shipments were to the United States.

Sulfur.—Recovery of sulfur from natural gas and petroleum and from sulfide ores, pyrite, and pyrrhotite, totaled 2.7 million metric tons in 1967. This establishes a quantity record 14 percent higher than in 1966. The value of the year's output, which reflected a strong market and higher price, increased over 60 percent. Although each of the source categories showed substantial

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gains, the great bulk of the year's increase was in the form of elemental sulfur extracted from sour natural gas. In 1966, 21 sulfur recovery plants, with a total annual capacity of 2.61 million long tons, were in operation. Nine new plants with a combined capacity of 1.14 million tons were scheduled to commence production before yearend 1967. All but two of the 30 plants are in Alberta. The Great Canadian Oil Sands Ltd. project, officially opened in September 1967, includes a sulfur recovery plant designed to produce 300 tons per day. Late in the year, Pan American Petroleum Corp. opened a new plant near Crossfield, Alberta, to recover 1,480 long tons of sulfur per day from sour gas. This is one of the largest sulfur recovery plants in North America.

During the latter part of 1967, native sulfur occurrences were discovered 265 miles north-northwest of Edmonton on the corner of Wood Buffalo National Park, and in the Hay River and Winifred Lake regions. The economic potential of these occurrences has not been fully determined.

Canadian exports of sulfur in 1967 totaled 1,609,048 tons nearly half of this went to the United States. Smaller quantities were shipped to India, Australia, and 18 other countries.

MINERAL FUELS

Coal.—Although total coal production in 1967 was slightly higher than in 1966, yearly output has remained close to 10.3 million metric tons for the past 4 years. Since 1963, rising mine costs and competition from imported petroleum have resulted in a quantitative decline of 12.6 percent in production from Nova Scotia and New Brunswick. This has been complemented by a 15.0-percent rise in output during the same period from mines in the three western provinces. The continuation of these trends was given impetus in 1966 with the decision of Dominion Steel and Coal Corp. Ltd. (DOSCO) to transfer its Cape Breton Island mines to a Crown Corporation that would phase out the local coal mining industry over a 15-year period. The Cape Breton Development Corporation, established by the Dominion and Provincial Governments, has undertaken substantial investment in modern facilities and consolidation of coal mining operations. A concurrent program of the Corporation aims at encouraging the development of other economic endeavors that will eventually replace the mines. The outlook for a continuing rise in coal production in British Columbia and Alberta is based on the growing demand for power generation and Japanese interest in the coking coal resources of those provinces.

Canada's national coal balance is summarized for recent years as follows:

	Million metric tons		
	1964	1965	1966
Production	10.3	10.5	10.3
Imports:			
Anthracite	.6	.6	.6
Bituminous	12.8	14.2	14.2
Total available	23.7	25.3	25.1
Consumption	23.5	24.5	23.7
Exports	1.2	1.1	1.1

Source: Dominion Coal Board and Dominion Bureau of Statistics.

Principal statistics for the Canadian coal mining industry in 1966, as compiled by Dominion Bureau of Statistics[10] (corresponding data for 1965 in parentheses), were as follows: Number of mines, 72 (86); average number of employees, 8,564 (9,076); value of production, f.o.b. mines, $75.4 million ($70.2 million); average production in metric tons, per man-day —total, 4.70 (4.71), from strip mines, 18.28 (17.19), and from underground mines, 2.82 (2.82).

Subvention payments for the 1966–67 fiscal year, April 1 to March 31 (1965–66 in parentheses), were reported by the Dominion Coal Board[11] as follows: Tonnage to which applied, 5.8 million metric tons (4.1 million); total cost, $34.9 million ($20.7 million); cost per ton, $5.99 ($5.03). Domestic consumption of coal in 1967 including 1.2 million tons for export has been estimated at 23,572,000 metric tons, of which about 13.7 million was supplied by imports from the United States.

[10] Dominion Bureau of Statistics. The Coal Mining Industry for Calendar Year 1966. Cat. No. 26–206 (annual), November 1967.
[11] Dominion Coal Board, Nineteenth Annual Report, 1966–67. Ottawa, Canada, 1967.

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Table 5.—Canada: Coal consumption by use

Consumer	1963	1964	1965	1966	1967
Total consumption.....thousand metric tons..	22,252	23,478	24,500	23,653	23,572
Household.....percent..	15.6	13.0	10.7	9.0	8.5
Power and industrial.....do....	53.7	56.5	60.4	60.4	60.5
Coke and gas.....do....	23.3	22.7	21.8	22.5	22.3
Transportation.....do....	2.4	2.3	2.1	2.4	2.4
Colliery and waste.....do....	.7	.6	.5	1.0	1.0
Export.....do....	4.3	4.9	4.5	4.7	5.3

Petroleum and Natural Gas.—All sectors of the Canadian petroleum and natural gas industries achieved record production in 1967. Crude oil and condensate output—about 962,300 barrels per day—and natural gas liquids—averaging 146,200 barrels—represented a total increase of 9.4 percent above the 1966 level. Sales of natural gas averaged 3.14 billion cubic feet per day in 1967, an increase of 11.6 percent above the 1966 daily average. Greater exports of crude petroleum and natural gas, all to the United States, were influential factors. Canada shipped additional petroleum to the United States during the international petroleum supply emergency caused by the Middle East crisis in mid-1967. Increased exports of Canadian gas to the United States were authorized late in 1966.

Exploration and development drilling expenditures in Western Canada totaled $535.9 million in 1967, compared with $504.1 million in 1966. Throughout Canada, survey crews, predominantly seismic, logged a total of 1,156 crew-months, 264 more than in 1966. More than half of these field activities were in Alberta. A total of 12,851,897 feet was drilled in 3,021 completed wells, of which 6.6 million feet in 1,543 wells was classified as exploratory and stratigraphic drilling. Approximately 98 percent of the total footage was in Western Canada. Offshore drilling, two wells on the west coast and one on the east coast, totaled about 35,000 feet. According to estimates by the Canadian Petroleum Association,[12] proved reserves of crude oil and natural gas liquids totaled 9,548 million barrels, and marketable reserves of natural gas amounted to 45,682 billion cubic feet as of December 31, 1967.

Industry activity has been centered recently in the Zamba Lake and Rainbow Lake areas of northwestern Alberta where over 100 new oil and gas pools have been designated. In late 1967 a consortium of 20 companies and the Federal Government, organized a company, Panarctic Oils Ltd., to conduct exploration and test drilling in the northern Arctic Islands. The Great Canadian Oil Sands Ltd. project near Fort McMurray in northeastern Alberta was officially opened in September. The venture, which has cost about $217 million, is designed to produce 45,000 barrels of high-grade synthetic crude oil daily from 100,000 tons of bituminous sand.

Receipts of crude oil, condensate, and pentanes at Canada's 41 refineries totaled 387.7 million barrels in 1967. Of this total, 224.6 million barrels was from domestic sources, 103.3 million barrels from Venezuela, and the balance largely from Saudi Arabia, Nigeria, and other countries. Exports, all to the United States, totaled 151.4 million barrels in 1967, compared with 126.9 million barrels in 1966.

Domestic sales of Canadian gas in 1967 amounted to 631.9 billion cubic feet (594.1 billion in 1966), and net exports sales, all to the United States, totaled 444.6 billion cubic feet in 1967, compared with 389.3 billion cubic feet in 1966.

[12] Canadian Petroleum Association. 1967 Statistical Yearbook, Calgary, Alberta, 1968.

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The Mineral Industry of Chile

By Lester R. Brown, Jr.[1]

In 1967, the Government and copper producers of Chile completed the first year of a joint effort to substantially increase copper output, copper exports, and foreign exchange earnings.

Chile, recognizing the need for increased foreign exchange earnings to cover the financing of additional imports for an increasing population, has turned to the copper industry to help fulfill these needs in the shortest possible time. The enactment of the "Chileanization" laws in 1966 was the outgrowth of the administration's efforts to carry out these plans. This copper expansion effort, considered fundamental to Chile's economic growth, made headway during the year but the need for extra effort in the four remaining years also became evident if the 1971 copper production goal of approximately 1.1 million tons is to be attained.

One of the added benefits to the Government anticipated from increased copper output will be greater tax income from increased producer profits. The additional tax income will aid the Government in its anti-inflation program as well as its fiscal stability effort. A table of selected Chilean economic indicators follows:

Indicator	1965	1966	1967
Gross National Product (GNP), at current prices [1]			
millions of Escudos	17,547	24,336	• 29,600
Population [2] millions	8.6	8.8	9.0
GNP, per capita Escudos	2,040	2,765	3,289
Consumer price index, in percent above previous year [1]	26	17	21.9
Exchange rates, Escudos per U.S.$: [1]			
Bankers spot (buying)	3.127	3.955	5.031
Bankers futures (buying)	3.310	4.001	5.031
Brokers (buying)	3.739	4.644	5.697

• Estimate.
[1] U.S. Embassy, Santiago, Chile, State Department Airgram A-654, Economic Trends Report, June 7, 1968. 11 pp.
[2] U.S. Agency for International Development. Economic Data Book for Latin America: Chile. July 1968. 12 pp.

Chile continued to be a significant world supplier of certain mineral commodities in 1967, the principal one being copper in various forms. It ranked third in world comparisons in production of mine copper, following the United States and the U.S.S.R. and remaining slightly ahead of Zambia. It continued to be one of the world's leading copper-exporting countries. As a coproduct of the copper industry, molybdenum output continued to rank Chile in third place in a free world comparison, behind the United States and Canada.

Chile continued to be the world's only producer of natural nitrates as well as the largest producer of iodine, a byproduct of the nitrate industry. The country also produced significant amounts of iron ore for domestic and world markets as well as minor amounts of gold and silver, byproducts of the copper industry.

In 1965 the Government administration under President Frei proposed legislation to greatly expand copper production and thereby increase foreign exchange earn-

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ings, and to acquire partial ownership of the major copper producers. (Political opponents had proposed outright nationalization.) To accomplish these ends, the Chileanization program set more attractive and stable tax scales for the companies in return for new investments to increase production. Partial Government ownership of newly-to-be-established mixed companies was to be constituted in a reorganized Copper Department, to be known as the Copper Corporation, (Corporación del Cobre) (CODELCO), with broad and far-reaching administrative powers.

Progress was slow, and the complete Chileanization legislation was not finally approved until April 25, 1966, when the last two measures, State guarantees for loans to the proposed mixed companies and the granting of certain tax and import privileges in return for obligatory reinvestment of profits, were finally passed as riders to wage readjustment legislation. Much of the rest of 1966 was spent in drafting individual agreements with the private companies.

The first investment decree signed under Chileanization was on December 9, 1966, for Compañía Minera Andina S.A. The decree established Andina as a mixed company whose equity ownership was to be held jointly by the Cerro Corp. of New York (75 percent) and the Chilean Government through CODELCO (25 percent). The decree included among other items an authorized investment of $89 million in the Rio Blanco copper mine project; the establishment of a 15 percent tax rate applicable to profits of Compañía Minera Andina S.A. and a 30 percent withholding tax applicable to dividends or profits distributed by Andina to Cerro Corp.; the establishment of a 10 percent annual rate of depreciation (with certain carry-forward provisions) applicable in the calculation of Andina's taxable income; the establishment of Andina's obligation to reinvest a maximum of 4 percent of net profits in Chile; and a provision for a maximum 25-year franchise period.[2]

Decrees were signed on December 23, 1966, allowing for the expansion of two existing Anaconda Company subsidiaries, the Chile Exploration Co. (Chuquicamata) and the Andes Copper Mining Co. (El Salvador). The investment decree for Compañía Minera Exótica S.A., the mixed company whose ownership participation was established as 75 percent Anaconda Company and 25 percent CODELCO, was signed on February 10, 1967.

The decree for Sociedad Minera El Teniente S.A. was signed on March 1, 1967, and was considered to be the most far-reaching of any of the decrees signed. For the payment of $80 million, it allowed for the transfer of the El Teniente property of the Braden Copper Co., a Kennecott Copper Corp. wholly owned subsidiary, to a new corporation whose ownership equity was divided 51 and 49 percent, respectively, between CODELCO and Braden Copper Co. The transfer was completed in April 1967 but Braden continues to operate the El Teniente mine under a management contract.

Total investment by the end of 1971 under the "Chileanization" program has been projected at $467 million. Approximately 20 percent of this amount had been invested by the end of 1967. On this basis, it will require an annual $93 million investment for the next 4 years to reach the target.[3]

PRODUCTION

In 1967 Chilean copper output was about the same as in 1966; apparently considerably more refined copper was produced, even allowing for uncertainties of the preliminary 1967 data. Chile's iron ore output was 10 percent less in 1967 than that reported for 1966. Output of molybdenum in concentrates during 1967 was approximately the same as in 1966, reflecting the fact that it is obtained as a byproduct of copper.

Among the nonmetals, barite production in 1967 increased 130 percent over that of 1966 although the tonnage remained relatively small. Some of the increase presumably may be in response to increased demand from the petroleum industry.

Chilean nitrate production in 1967 was 18 percent less than in 1966; output of sodium nitrate, the larger component of the total, declined 19 percent, while potas-

[2] Cerro Corp. Report on the Rio Blanco Copper Mine Project. New York, Feb. 24, 1967, 8 pp.

[3] U.S. Embassy, Santiago, Chile. State Department Airgram A-645, Economic Trends Report, June 7, 1968, 11 pp.

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sium nitrate output declined by 8 percent.

Chilean sulfur production continued to increase. The sulfur content of the refined product and that contained in caliche reportedly increased 35 percent over that of 1966 while the sulfur content of sulfuric acid gained 6 percent. The acid production originates in the copper industry.

Chilean coal production continued to decline as operations became more extended and underground haulage distances increased. Crude petroleum production decreased for the third consecutive year but guarded optimism was expressed as it was noted that the year-to-year decrease was the smallest of any year since the decline began.

Table 1.—Chile: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967 [p]
Metals:					
Copper content of—					
Ore, concentrate, and precipitates, not further processed	46,679	46,088	[r] 31,139	[p] 39,075	NA
Matte and slags	96	181	--	--	--
Blister	298,424	308,998	[r] 285,891	[p] 267,706	NA
Refined metal	258,942	278,076	[r] 288,878	[p] 356,889	397,493
Total	604,141	633,343	[r] 605,908	[p] 663,670	663,869
Gold content of—					
Gold ore and concentrate—troy ounces	21,793	9,299	[r] 1,346	[r] NA	NA
Copper ore, concentrate, metal—do	53,420	54,497	[r] 54,335	74,484	52,867
Lead ore—do	26	15	[r] 255	NA	NA
Silver ore—do	[r] 5	--	--	--	NA
Placer gold—do	113	27	45	[r] NA	NA
Refined metal (other than in above)—do	1,937	1,155	[r] 2,916	NA	NA
Total—do	77,294	64,993	[r] 58,897	74,514	55,963
Iron and steel:					
Iron ore—thousand tons	8,507	9,853	[r] 12,145	12,246	11,025
Average iron content—percent	64.43	64.40	63.91	63.80	63.49
Smelter and mill products:					
Pig iron—thousand tons	418	437	309	433	498
Ferroalloys—do	17	10	13	[r] 12	NA
Steel ingots—do	521	584	477	[r] 577	638
Semifinished products—do	442	474	[r] 374	449	515
Rolled products—do	366	379	[r] 391	[r] 486	468
Pipe and structural shapes—do	10	[r] 10	[r] 9	[r] 10	5
Lead content of—					
Ore and concentrate, not further processed	868	1,116	[r] 783	[r] 827	404
Smelter products	220	--	--	--	--
Total	1,088	1,116	[r] 783	[r] 827	404
Manganese ore	46,479	19,861	[r] 16,587	17,921	14,854
Average manganese content—percent	44.26	46.25	46.77	46.93	46.95
Mercury—76-pound flasks	613	267	[r] 435	[r] 96	184
Molybdenum concentrate, content, molybdenum (Mo)	2,903	3,807	[r] 3,693	[r] 4,731	4,877
Silver content of ore and concentrate of—					
Silver—thousand troy ounces	4	--	[r] --	[r] NA	NA
Copper (including blister)—do	2,710	3,041	[r] 2,918	2,993	2,232
Lead and zinc—do	39	52	[r] 49	[r] NA	NA
Gold—do	15	4	[r] 5	[r] NA	NA
Total	2,768	3,097	[r] 2,972	3,610	3,065
Zinc, content of ore and concentrate—do	505	1,005	[r] 1,383	2,087	1,123
Nonmetals:					
Barite	1,019	1,091	[r] 2,841	2,038	4,674
Borates: Ulexite, 33 percent boron oxide (B_2O_3)	[r] 2,982	3,314	[r] 4,602	3,742	NA
Cement, portland—thousand tons	1,166	1,267	[r] 1,195	1,364	1,203
Clays:					
Kaolin	36,899	45,963	[r] 30,675	40,501	29,424
Other	25,675	[r] 29,968	[r] 42,619	37,747	90,753
Diatomite	NA	NA	129	479	20
Feldspar	424	827	[r] 525	1,117	897
Fluorspar	[r] NA	[r] NA	[r] NA	215	455
Gypsum:					
Crude	116,328	119,160	[r] 101,107	119,620	132,750
Calcined	47,893	44,063	[r] 65,232	45,552	48,454
Iodine	2,156	2,161	2,280	2,931	2,216

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Table 1.—Chile: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967 [p]
Nonmetals—Continued					
Lapis lazuli—kilograms	3,100	16,500	r 20,265	--------	8,200
Limestone—thousand tons	1,846	1,923	r 1,784	2,216	1,916
Nitrates:					
Sodium—do	993	1,070	1,050	945	762
Potassium—do	143	104	109	117	107
Total—do	1,136	1,174	1,159	1,062	869
Phosphates:					
Apatite	13,909	13,138	r 10,074	--------	--------
Guano:					
Red	18,248	11,464	17,958	13,354	13,046
White	3,947	3,587	3,848	2,399	3,261
Total phosphates	36,104	28,189	r 31,880	15,753	16,307
Pozzolan—thousand tons	129	141	r 141	145	134
Quartz	80,380	119,111	r 127,195	128,314	148,551
Salt, common	48,242	93,959	r 99,691	202,619	417,678
Sodium sulfate	32,421	30,685	r 41,488	34,165	18,218
Sulfur:					
Refined and in caliche	43,437	43,878	r 34,965	41,442	55,969
Content of sulfuric acid	13,873	15,675	10,635	11,458	12,187
Total	57,310	59,553	r 45,600	52,900	68,156
Talc	2,582	2,760	r 4,374	2,269	3,174
Mineral fuels:					
Coal, bituminous and lignite:					
Mine run—thousand tons	1,719	1,789	1,727	r 1,652	1,496
Marketable—do	1,604	1,677	1,629	r 1,542	1,397
Coke:					
Oven and beehive—do	249	246	213	e 200	NA
Gashouse—do	99	83	e 81	e 80	NA
Natural gas (gross) [2]—million cubic feet	r 182,062	r 221,822	r 219,468	r 234,954	248,597
Natural gas liquids—thousand 42-gallon barrels	r 3,018	r 3,583	r 3,343	r 3,372	3,273
Petroleum:					
Crude—do	13,206	13,687	12,704	12,428	12,369
Refinery products:					
Aviation gasoline—do	369	r 416	320	284	283
Motor gasoline—do	r 5,744	r 6,121	r 6,417	r 7,250	8,209
Kerosine—do	r 1,842	r 1,915	r 1,879	r 2,043	2,330
Distillate fuel oil—do	r 2,685	r 3,096	r 3,059	r 3,658	4,003
Residual fuel oil—do	r 3,858	4,072	3,766	5,716	6,870
Liquid petroleum gas—do	428	r 466	539	r 791	1,654
Solvents—do	r 77	r 99	r 106	r 119	129
Other [3]—do	r 37	r 56	r 84	r 270	305
Total—do	r 15,040	r 16,241	r 16,170	r 20,131	23,783

e Estimate. p Preliminary. r Revised. NA Not available.

[1] In addition to commodities listed, Chile also produces unreported amounts of dolomite, iron oxide pigment marble, mica, and silica sand.

[2] Calculated at 35.3145 cubic feet per cubic meter.

[3] Includes mainly naphtha, white gasoline, and asphalt.

TRADE

The value of Chile's mineral commodity exports increased sharply in 1966 over 1965 figures and although 1967 data are not yet available, there are indications that mineral commodity exports again increased, though perhaps not at the same high rate. Mineral commodity export values for 1965 and 1966 were approximately $622 million and $785 million, respectively.

The 1966 gain was primarily registered in copper exports which were $641 million, accounting for some 82 percent of all mineral commodity exports and 73 percent of all Chilean exports, on a dollar basis.

Among copper exports in 1966, electrolytic copper registered the largest gain and copper wire registered a small increase in terms of value. These gains reflected both increased tonnages exported and increased unit values. An average price of Chilean copper on world markets for 1965, 1966 and 1967 has been given in U.S. cents per

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pound, 37.5, 47.6, 48.5, respectively.[4]

On a dollar basis, iron ore exports were about the same for the 2 years but the tonnage exported in 1966 was about 3 percent higher than in 1965.

Molybdenum in concentrates made a minor gain in 1966 but shipments of refined forms were not recorded.

Iodine exports increased 50 percent in 1966 over 1965 figures on both a value and weight basis.

On a dollar basis exported nitrates were about identical for the 2 years in question but there was a small tonnage increase of the potassium nitrate form.

Chilean mineral commodity imports constituted only about 13 percent of all Chilean imports for 1965 and 1966. Crude petroleum and petroleum refinery products together accounted for between 5 and 6 percent by value of all Chilean imports, followed by smaller value totals for iron and steel, fertilizers, and tin.

A tabulation comparing mineral commodity trade and total trade follows:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	622	688	90.4
1966	785	881	89.1
Imports:			
1965	82	604	13.6
1966	102	757	13.5
Net trade balance:			
1965	+540	+84	XX
1966	+683	+124	XX

XX Not applicable.

Source: Comercio Exterior, Chile, 1965 and 1966, Departmento de Estadísticas del Servicio de Aduanas Santiago, Chile.

[4] Work cited in footnote 3.

Table 2.—Chile: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Copper:			
Ore and concentrate	5,819	10,939	West Germany 6,921; United States 1,521.
Cement	12,239	9,851	Japan 8,684; Spain 667.
Precipitates	8,120	8,463	West Germany 5,919; Japan 2,544.
Sulfate	10	114	Mainly to Brazil.
Oxide	391	242	Spain 146; Japan 96.
Slag, dross, and skimmings	801	757	All to Sweden.
Metal:			
Ingot and other primary forms:			
Blister	274,182	239,212	United States 160,095; United Kingdom 40,446.
Fire refined	68,281	101,957	United Kingdom 25,883; Italy 18,760.
Electrolytic	150,738	221,343	Netherlands 63,095; United Kingdom 46,453.
Alloys, unwrought	-------	29	Spain 18; Netherlands 9.
Semimanufactures:			
Unalloyed:			
Plates and sheets	28,041	2,552	Italy 2,106; Spain 249.
Wire	36,488	25,639	United States 6,899; Venezuela 3,372; Spain 3,213.
Other	649	991	United States 809; Peru 66.
Alloyed	67	116	United States 71; Uruguay 14.
Gold ores and concentrates, including auriferous polymetal ores and concentrates.	16,145	14,423	Japan 8,742; United States 2,950; Poland 2,731
Iron and steel:			
Iron ore thousand tons	10,729	11,095	Japan 7,902; United States 2,383.
Ferroalloys	4,904	5,891	Colombia 2,500; United States 1,621.
Semimanufactures	4,957	9,993	Argentina 6,199; Uruguay 2,970.
Lead, lead-copper, ore, concentrate and and slag.	707	-------	
Manganese ore and concentrate	12,844	2,440	All to West Germany.
Mercury 76-pound flasks	98	-------	
Molybdenum:			
Concentrate	6,501	6,512	United Kingdom 1,789; West Germany 1,568.
Refined metal	1,006	-------	
Silver-copper, and silver-copper-lead concentrates.	30,217	37,247	West Germany 26,690; Poland 6,113; Japan 4,444.
Zinc: Slag	153	-------	

See footnotes at end of table.

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Table 2.—Chile: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals:			
Borate, calcium	180	90	All to Uruguay.
Cement	1,695	2,554	All to Peru.
Iodine	2,262	3,384	United States 2,011; United Kingdom 500.
Kaolin	5	-------	
Lapis lazuli----kilograms	10,510	6,382	West Germany 2,096; France 1,705.
Marble	31	-------	
Nitrates:			
Potassium enriched	97,607	107,040	United States 70,858; Brazil 12,710.
Sodium	797,697	743,601	United States 272,924; Netherlands 144,414; Spain 102,350.
Quartz	5	-------	
Salt, common	20,000	96,183	All to Japan.
Sodium sulfate	1,275	152	Brazil 101; Uruguay 51.
Mineral fuels:			
Coal	850	1,032	Bolivia 918; United Kingdom 114.
Coal briquets	200	-------	
Coal tar products (oils and greases)	-------	8	Mainly to Peru.
Natural gas liquids: Propane	31,403	30,104	All to Argentina.
Petroleum refinery products:			
Lubricating oil	41	50	Mainly to Peru.
Gasoline	44	-------	

Source: Comercio Exterior, Chile, 1965 and 1966, Departamento de Estadísticas del Servicio de Aduanas, Santiago, Chile.

Table 3.—Chile: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite, calcined	1,562	1,543	Mainly from Guyana.
In powder form----kilograms	1,233	12,096	Mainly from China.
Ingots	3,148	2,969	United States 1,988; Canada 953.
Filings	57	78	Mainly from United States.
Semimanufactures	216	239	United States 110; Netherlands 51.
Antimony, all forms	65	65	United Kingdom 45; Formosa 16.
Bismuth, all forms	1	2	Mainly from Peru.
Cadmium, all forms	3	2	Mainly from Mexico.
Chromium, all forms	90	193	West Germany 80; France 34.
Copper and its alloys, semimanufactures	14	551	West Germany 384; United States 140.
Gold, semiwrought and wrought. troy ounces	5	55	All from United States.
Iron and steel:			
Pig iron	558	20,659	West Germany 10,636; United States 10,022.
Ferroalloys	396	309	Mainly from United States.
Fillings, cuttings	122	45	United States 22; United Kingdom 20.
Bars	6,494	7,865	United States 3,415; West Germany 2,139.
Structural shapes and sections	6,054	6,750	West Germany 3,837; United States 1,827.
Plates and sheets	31,238	76,352	United States 37,514; Japan 34,652.
Straps and hoops	276	560	West Germany 229; United States 75.
Pipes and tubes	20,165	26,546	United States 10,492; Mexico 7,030.
Wire	718	1,626	West Germany 1,107; United States 200.
Rails and accessories	5,474	8,666	United States 3,086; West Germany 1,676.
Special alloy iron and steel	2,405	2,261	West Germany 1,246; Republic of South Africa 534.
Lead:			
Ingots:			
Unalloyed	1,717	1,534	Peru 974; United States 480.
Alloyed	66	184	Mainly from Peru.
Semimanufactures	86	1,167	Mainly from West Germany.
Filings, cuttings	1	40	Do.
Manganese and chromium, mixed ore	13	-------	
Mercury----76-pound flasks	3	4	Mainly from Mexico.
Molybdenum, all forms	2	(1)	Mainly from United States.
Nickel:			
Ingots	20	39	Canada 14; United Kingdom 7; West Germany 7.

See footnotes at end of table.

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Table 3.—Chile: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Nickel—Continued			
Electrolytic, in pieces	55	27	Canada 13; United States 11.
Semimanufactures	13	42	West Germany 27; United States 8.
Filings, cuttings	11	15	United Kingdom 10; Canada 5.
Platinum, all forms—troy ounces	90	433	Switzerland 271; West Germany 124.
Tin: Ingots—long tons	791	949	Malaysia 620; United Kingdom 291.
Zinc:			
Ingots	6,495	4,345	United States 2,228; Peru 1,206.
Semimanufactures	265	352	United States 148; West Germany 52.
Other ores and concentrates, n.e.s	106	128	Mainly from Australia.
Other metals, n.e.s	36	102	Mainly from West Germany.
Nonmetals:			
Abrasives:			
Emery and carborundum	101	112	United States 50; West Germany 36.
Other	100	257	United States 128; West Germany 114.
Asbestos	6,180	8,329	Mainly from Canada.
Cement	8,143	6,047	West Germany 3,018; United Kingdom 916; United States 775.
Chalk	2	52	Mainly from France.
Clays:			
Bentonite	1,847	2,636	Argentina 1,347; United States 1,273.
Kaolin	260	336	Mainly from United States.
Refractory	553	1,281	Do.
Other n.e.s	1,925	3,035	Do.
Diatomite	320	459	United States 289; Mexico 170.
Dolomite	17,479	25,813	Mainly from United States.
Fertilizers:			
Potassic	11,134	14,457	France 6,606; Italy 3,781.
Phosphate	94,938	71,690	United States 30,817; Belgium 17,989.
Superphosphate	94,938	109,219	Mainly from United States.
Fluorspar	753	1,053	Argentina 574; Republic of South Africa 335.
Fuller's earth	5	232	Mainly from Argentina.
Graphite	85	103	West Germany 62; United Kingdom 18.
Gypsum	-------	1	Mainly from West Germany.
Lime	30	26	Do.
Lithium minerals	15	83	South-West Africa 42; Argentina 41.
Magnesite:			
Raw	42	22	United Kingdom 17; United States 4.
Calcined	7,408	4,850	United States 3,604; Austria 867.
Mica	15	40	Mainly from Argentina.
Mineral wool	68	14	Mainly from United States.
Perlite	83	175	Argentina 113; Mexico 62.
Potassium hydroxide	182	215	West Germany 78; France 40; Belgium 35.
Quartz	1,012	825	Mainly from Mexico.
Salt	10	-------	
Sand	61	145	West Germany 58; United States 34.
Sodium carbonate	9,997	13,527	Mainly from West Germany.
Sodium hydroxide	8,932	10,099	West Germany 4,210; United Kingdom 3,123.
Stone, dimension:			
Marble	2	-------	
Other	85	76	All from Belgium.
Sulfur	100	10,508	United States 3,478; West Germany 3,345.
Talc	262	174	Argentina 91; Italy 60.
Other nonmetals, n.e.s	12,925	5,621	Mainly from United States.
Mineral fuels:			
Coal:			
Anthracite	494	547	Mainly from West Germany.
Bituminous	316,366	80,402	All from United States.
Coke, metallurgical	550	269	Do.
Petroleum:			
Crude	1,073,061	2,413,044	Mainly from Venezuela.
Refinery products:			
Gasoline:			
Aviation	349	9,837	Netherlands Antilles 7,369; Surinam 2,286.
Motor	9,915	2,346	Mainly from Netherlands Antilles.
Kerosine	67,484	73,770	Netherlands Antilles 53,048; Netherlands 11,002.
Distillate fuel oil	116,099	119,885	Netherlands Antilles 53,334; Peru 40,661.
Residual fuel oil	146,468	29,474	All from Venezuela.
Lubricants, including greases	48,104	12,715	Mainly from United States.
Asphalt	364	509	Trinidad and Tobago 340; United Kingdom 120.
Paraffin	11,367	9,755	United States 4,395; East Germany 2,665.
Other	272	459	Mainly from United States.

[1] Less than ½ unit.

Source: Comercio Exterior, Chile, 1965 y 1966, Departmento de Estadísticas del Servicio de Aduanas, Santiago, Chile.

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COMMODITY REVIEW

METALS

Copper.—The pattern of Chilean primary copper production in 1967 changed from previous years even though total 1966 and 1967 new copper output was nearly identical. Although total new copper production for the "Gran Mineria" sector of the industry varied little from that of 1966, a greater proportion of the output was in the electrolytic form as a result of increased output by Andes Copper's El Salvador operation and the Las Ventanas plant of Empresa Nacional de Mineria (ENAMI). Higher electrolytic copper output by these firms more than compensated for lower electrolytic copper production by Chile Exploration Co.'s Chuquicamata operation and for lower fire refined copper output by Braden Copper Co.'s El Teniente property. The latter achieved a record total copper output in 1967, and it was understood that some Braden blister copper was being processed at the Las Ventanas refinery during both 1966 and 1967.

The pattern change toward higher electrolytic copper output was the result of the first full year of operation of the Las Ventanas refinery, which increased output to 80,744 metric tons based on blister obtained from Braden and ENAMI.

Stripping operations were started in September 1967 to develop the Exótica ore body, adjacent to the Chuquicamata deposit. As one of the results of "Chileanization," this ore body is to be operated by Compañía Minera Exótica, S.A. Ore delivery was programed to start in mid-1970 after removal of some 90 million tons of overburden. The ore, principally chrysocolla, will be treated at the Chuquicamata oxide plant on a toll basis, thus filling a gap that has developed as Chuquicamata's oxide ore is phased out. It has been planned that Exótica will produce 100,000 metric tons of copper annually.[5]

The El Teniente mine set a new copper production record in 1967 at a reported 184,863 metric tons, a 27-percent increase over that of the previous year. The record was even more notable in that it occurred as ownership passed from the Braden Copper Co. to the newly formed Sociedad Minera El Teniente S.A. A $230 million expansion program has been initiated to increase copper production approximately 60 percent over the 160,000-metric-ton capacity of 1967. Plans include a new haulage and access tunnel, a new concentrator at Colon, enlargement of the Caletones smelter, and replacement of the Rancagua-Sewell narrow-gage railway with a modern highway.[6]

Compañía Minera Andina S.A. (Andina) was a newcomer to the Chilean mining scene, as full-scale construction of the Rio Blanco copper project started in early 1967. Andina will operate the Rio Blanco copper mine, 60 kilometers northeast of Santiago, at an elevation of about 12,500 feet in an area of severe physical handicaps and heavy snow. Snow control methods to insure maximum travel on the mine access road include erection of avalanche-diverting barricades, control of snowslides by artillery, and strategic deployment of snow-removal equipment.

Mining will employ the block caving method and will commence at a rate of 11,500 metric tons per day. The ore body reportedly contains about 109 million metric tons of disseminated chalcopyrite ore averaging 1.58 percent copper. After the ore is collected through various raises, it will be transported horizontally to an underground mill after which the concentrate will be piped to a filtering and drying plant. From there the concentrate will either be smelted at Las Ventanas or exported.

Preparation of the mine and related facilities is scheduled to be completed and concentrate production to begin in early 1971.[7]

Iron Ore.—Compañía de Acero del Pacífico S.A. (CAP), Chile's principal iron and steel producer, continued to operate its Algarrobo open pit iron mine about 40 kilometers southeast of the port of Guacolda in Atacama Province in northern Chile. The mine produced 3,218,260 metric tons of iron ore, slightly less than the 3,337,261 tons produced in the pre-

[5] The Anaconda Company. Annual Report, March 1968, 36 pp.
[6] Kennecott Copper Corp. Annual Report, March 1968, 32 pp.
[7] Work cited in footnote 2.
[8] Compañía de Acero del Pacífico, S.A., Annual Report, July 1, 1966, to June 30, 1967, 29 pp.

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vious period.[8] The reduction was credited to a work stoppage, the need of increased selective mining to secure product quality, and storage problems in the port of Guacolda. Of the total production reported in the period, 2,797,727 tons was exported.

Studies of ore reserves and processing improvement were continued, to assure that the product remain competitive on world markets. CAP reported that studies and the preliminary engineering of an ore concentrating plant had been contracted, and it was hoped plant operation might begin in 1970. The facility will treat crushing-plant rejects containing about 45 percent iron that totaled some 6.5 million tons at yearend and that have been accumulating at the rate of 1.5 million tons annually.

Bethlehem-Chile Iron Mines Co., a wholly owned subsidiary of Bethlehem Steel Corp. of the United States, was the only Chilean iron ore producer included in the "Gran Mineria" category; as such, it remained exempt from the requirement of returning all foreign earnings to Chile. The company is contractually obligated to supply all iron ore required by CAP's Huachipato steel plant.

Early in 1967, Bethlehem-Chile announced plans to invest $20 million to increase iron ore output from its Romeral mine, in Coquimbo Province, 25 kilometers north of La Serena. Also included were plans to step up the waste removal necessary for the mine's exploitation. Annual concentrate production was to be increased from 3 million to 4,083,000 tons and annual waste removal from 8 million to 22.5 million tons.

These principal items are to be included in the capital outlay: Electric power shovels, front-end loaders, various diesel haulage trucks and tractor rippers, all for pit operations; a new concentrating plant to replace the one presently in operation; new railroad haulage equipment, both ore cars and diesel-electric locomotives; increased generating capacity for the powerplant, port improvements to permit ships of 80,000 to 100,000 tons to be loaded; and increased port storage capacity from 600,000 tons to 2 million tons.

The Romeral ore body is lenticular in shape and of variable mineralization and grade, ranging from 30 to 65 percent iron with an erratic distribution of phosphorus as its principal impurity. The principal mineral is magnetite. Calculated reserves total 112 million tons of ore from which it is estimated 80 million tons of concentrate with a grade superior to 64 percent iron can be produced. This will require the removal of 229 million tons of waste material. Bethlehem-Chile Iron Mines Co. shipments for 1967 were reported[9] as follows:

	Metric tons
Romeral Division:	
Furnace ore shipped to:	
United States	501,842
Japan	1,471,559
CAP	668,990
Local sales	65
Total	2,642,456
Tofo Division:	
Furnace ore shipped to:	
Japan	209,000
CAP	15,000
Local sales	79
Total	224,079

Total Chilean iron ore exports have more than doubled since 1960.

Iron and Steel.—In light of the sustained growth in Chilean consumption of iron and steel products, as well as a potential export market, CAP, the country's largest steelmaker, has been carrying forward a continual expansion program. CAP's Huachipato plant, near the port of Talcahuano in Concepción Province, is near the country's largest coal mines and reserves at Lota and Coronel, as well as an abundant source of water for industrial uses, the Bío-Bío River. Production from the Huachipato plant for the past 3 fiscal years was as follows:

Product	Metric tons		
	1964–65	1965–66	1966–67
Pig iron	406,138	309,744	500,825
Steel ingots	541,095	438,151	589,743
Semifinished products	462,751	376,104	502,904
Finished product, (rolled)	363,249	384,118	402,407
Pipe	12,018	9,217	5,398

Source: Cía. de Acero del Pacífico S.A. Twenty-second Annual Report for Fiscal Year 1966/1967. Santiago, Chile, September 1967, 29 pp.

[9] Skilling's Mining Reveiw. V. 57 No. 8 Feb. 24, 1968, p. 8.

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Huachipato's second blast furnace was completed in 1966, giving the plant a wider margin of safety against production stoppages and helping to insure the annual plant capacity of 650,000 to 700,000 ingot tons. Plans call for this capacity to be increased to 1 million ingot tons of steel annually by 1971. By that same date, an additional 39 coke ovens are scheduled to be installed, bringing the plant total to 109.

Two new 90-ton oxygen converters are under construction at the plant and are scheduled for completion within the next 4 years. The new shop will have a capacity of 800,000 tons of ingot steel annually and will replace the present Siemens-Martin system.[10]

An electrolytic tinning line, scheduled under an earlier (1962–65) expansion plan, was reportedly slated to start production in September 1968 at the Huachipato plant. Costing US$10 million, the line's annual capacity is initially to be 65,000 tons, later to be increased to 140,000 tons.[11]

Vanadium.—CAP's annual report for fiscal 1966–67 indicated that an accord had been reached with the Continental Ore Corp. of New York (COC) regarding the installation of a plant for the recovery of vanadium pentoxide (V_2O_5) from the steel slag in the Huachipato area. A corporation (Vanadio S. A.) was to be formed, in which CAP and COC would be partners.[12]

NONMETALS

Fertilizer Materials.—Nitrogenous[13].—Nitrate production continued to decline in 1967, with total output falling 18 percent, sodium nitrate output declining 19 percent, and potassium nitrate output dropping 8 percent.

Anglo-Lautaro Nitrate Co. remained the country's major nitrate producer, followed by Empresa Salitrera Victoria, which since 1960 has been operated by the Government through Corporación de Fomento de la Producción (CORFO).

In late 1966, Anglo-Lautaro made known to the Government plans to make production changes in its Maria Elena operation. According to the company, because of increased production costs and tightening conditions in the world market, the Maria Elena facility was operating at a loss. The projected restructuring was to include elimination of sodium nitrate production, an increase of annual potassium nitrate production to 200,000 tons, and annual outputs of 189,000 tons of sodium sulfate and 1,000 tons of iodine, and would require 1,800 fewer men.

Chilean nitrate exports for 1967 were as follows:

Destination	Metric tons
United States	266,474
Spain	69,826
Netherlands	47,220
Brazil	37,575
Japan	35,100
France	24,984
Mexico	19,701
Italy	12,000
Others	120,886
Total	633,766

MINERAL FUELS

Natural Gas.—The Empresa Nacional de Petróleo (ENAP), the State petroleum enterprise and the sole natural gas producer in Chile, reported a 1967 production of 248,597 million cubic feet,[14] 5.8 percent over that of 1966. Over 75 percent of production was reinjected with Posesión (a mainland field) and Cullen (a Tierra del Fuego Island field) fields receiving the major portions.

ENAP completed a 150-kilometer natural gas transmission line at yearend 1966, linking Kimiri-Aike field and the city of Punta Arenas. The principal consumer was the electric power plant of Empresa de Electricidad S.A. (ENDESA). Gas sales amounted to about 318 million cubic feet for the year.[15]

Petroleum.—Crude petroleum production in 1967 decreased slightly from the 1966 total, but it was the smallest year-to-year percentage change since the first decrease was recorded in 1965, and

[10] U.S. Embassy, Santiago, Chile, State Department Airgram A-142, Sept. 15, 1967, 7 pp.
[11] Tin International. Tin Publications, Ltd., London, May 1968, p. 122.
[12] Cía. de Acero del Pacífico S.A. Twenty-second Annual Report for Fiscal Year 1966–67. Santiago, Chile, September 1967, 29 pp.
[13] U.S. Embassy, Santiago, Chile. State Department Airgrams: A–544, Mar. 3, 1967; A–256, Nov. 24, 1967; A–265, Dec. 1, 1967; and A–378, Jan. 29, 1968.
[14] Cubic meters are converted to cubic feet at the rate of 35.3145 cubic feet per cubic meter.
[15] Empresa Nacional del Petróleo, Corporación de Fomento de la Producción, Santiago. Annual Report. 1967, 16 pp.

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ENAP expressed guarded hopes as the daily production averages for the last quarter surpassed those for the last quarters of 1965 and 1966. Slightly more than half of the total came from fields on Tierra del Fuego as it had for the previous 2 years.

No new petroleum discoveries were made during the year. Almost twice as many wells were drilled in 1967 as in 1966 but the average termination depth was 2,110 meters in 1967 compared with 2,675 meters in 1966. A comparative table of well terminations for the last 2 years follows:

Type of well	Number of completions			
	Petroleum	Gas	Dry	Total
1966: [1]				
Exploration	--	2	10	12
Extension	--	2	6	8
Development	6	2	6	14
Total	6	6	22	34
1967:				
Exploration	--	--	7	7
Extension	3	3	13	19
Development	24	4	11	39
Total	27	7	31	65

[1] Empresa Nactional del Petróleo, Corporación de Fomento de la Producción, Santiago. Annual Report. 1966, 16 pp.

ENAP continued to operate gas treatment plants at the Manantiales and Cullen fields on Tierra del Fuego and an adsorption plant at the Posesión field, north of the Strait of Magellan during 1967. The major part of the country's liquid fuel needs, however, was met by output of two petroleum refineries, one in Concón in Valparaíso Province and the other in Concepción Province. It was estimated that the combined productions of the two refineries and the gas plants of Manantiales and Cullen supplied requirements to the following degree: Motor and aviation gasoline, kerosine, and liquid petroleum gas 100 percent; distillate fuel oil 95 percent; and residual fuel oil 75 percent.

The Concepción refinery started operations at the end of 1966, and officially inaugurated on March 13, 1967, has assumed some of the load previously carried by the Concón refinery. During 1967, the two refineries processed 24,520,195 barrels of crude, 11,999,700 supplied by Chile, and 12,520,495 imported. The net production for sale from the two refineries was of the following order for 1967:

Commodity	Net production (thousand U.S. 42-gallon barrels)	
	Concón	Concepción
Motor gasoline	3,604	4,487
Aviation gasoline	283	--
Kerosine	881	1,411
Distillate fuel oil	1,493	2,362
Residual fuel oil	5,021	1,849
Liquid petroleum gas	396	1,259
Other, including solvents	433	--
Total	12,111	11,368

About midyear, construction of a 350-kilometer pipeline from Concepción to San Fernando was finished, connecting with an older pipeline between Concón-Maipú and San Fernando thus allowing both refineries to feed the Santiago area and, in time, aid in a better feed for the Central-South Chile zone. The pumping of products from Concepción north was initiated at the end of July, and in November the San Fernando terminal received its first delivery of liquid petroleum gas.

Petroquímica Chilena S. A., a State petrochemical entity, was established in 1967 (to replace Petroquímica Chilena Ltda.) with capital supplied equally by the Corporación de Fomento de la Producción (CORFO) and ENAP. Its object was the alinement and development of the national petrochemical industry. Part of its plans include the construction of various petrochemical plants, generally to be located in the San Vicente area. Construction progressed in 1967 in the Concepción area on a basic chlorine products plant whose output will include part of the feed stocks for other petrochemical plants of the area as well as caustic soda and hydrochloric acid.

Based on Petroquímica Chilena S.A.'s large gas holdings in the Magallanes area, market studies were underway to determine the feasibility of installing a large capacity plant to manufacture nitrogen derivatives such as ammonia, urea, and other fertilizers.

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The Mineral Industry of Mainland China

By K. P. Wang [1]

Mainland China continued to be an important mineral producer by world standards, however, mineral output value (mine output plus added value derived from smelting and processing) may have declined 30 percent from the $4 to $4.5 billion estimated for 1966. The year 1967 was the second of the Cultural Revolution, with politics adversely affecting economics and industrial production. The year began with a militant call to destroy anti-Maoists and ended in a partially successful campaign to end violence and disorder. It was officially admitted that numerous and wide-spread armed clashes and open conflicts took place between industrial workers and technocrats (technologists and technicians), peasants, soldiers, and Red Guard students. In addition, the railroad system was disrupted, and there was much unauthorized borrowing of trucks for demonstrations and other activities.

A significant development in 1967 directly influencing mineral output was the role played by the Chinese People's Liberation Army (PLA) in maintaining order. At yearend, Peking claimed undisputed control of only three major municipalities and six provinces, whereas PLA held the power elsewhere. The PLA was given unprecedented access to management of the economy, and it helped restore normality to many industrial and mining centers. The brief open defiance to Peking of the military authority in Wuhan, a well-known steel center, in July caused widespread repercussions and showed that even the Army was not quite unified.

The sharp decline in industrial activities was accentuated by the breakdown of supply and products delivery systems. Good agricultural performance also was marred by political disorder plus difficulties in obtaining fertilizers. Foreign trade suffered accordingly. Capital construction, which had picked up sharply in 1966, came to a standstill in 1967. Technical personnel and industrial workers found it hard to recover from the harassment of the Red Guard. Loss of 2 years of schooling created a further gap in future supply of technicians. The net effect of the Cultural Revolution in 1966–67 is that the Chinese mineral industries will not achieve substantial growth again until the 1970's.

Every important sector of the mineral industry except salt, had a bad year. After a record high production year in 1966, Taching in Manchuria—the country's leading oil center—encountered serious labor problems in 1967, such as 10,000 Red Guards leaving work and going to Peking, and brief, but nevertheless outright, fights between Maoists and anti-Maoists. The new Shengli oilfield in Shantung underwent further development in 1967 with no great mishap. Armed clashes took place at the Karamai oilfield in Sinkiang during May. Several blast furnaces at the famous Anshan steelworks were damaged during an August 1967 scuffle, after a peaceful first half year. Most other steel centers also went through civil strife. The coal industry suffered a similar fate, with problems compounded by the transport bottleneck which in turn created coal shortages at consumption points. Despite great need for fertilizers, expansion of facilities had to slow down. Reduced construction cut deeply into demand for cement. Nonetheless, China exploded its first hydrogen bomb on June 7,1967, following five successful nuclear tests in the last 5 years.

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PRODUCTION

The Peking official organ—Jen-Min Jih-Pao's (Peoples Daily)—voiced a sober note in its 1968 New Year's editorial and avoided any favorable claims in industrial output. Instead, it stressed the prime economic task ahead of restoring order and providing leadership for the sluggish, deflated economy. There was no mention of the Third 5-Year Plan, supposed to have started in 1966. This suggested that the near disastrous performance of the economy in 1967 made it necessary to set aside this ambitious plan for at least several years.

Only certain lesser mineral industries escaped serious cutbacks in 1967. Salt output held its own because producing fields along the Yellow Sea coasts escaped political turmoil. Output of most of the nonferrous metals produced chiefly for export, such as tungsten, tin, antimony, mercury, and bismuth, was down, slightly not so much because of the Cultural Revolution but rather because of difficulty in selling in world markets. Some lesser nonmetallics not so affected by transportation were produced at about 1966 levels to meet domestic and international demand. Internally,

Table 1.—Mainland China: Production of metals and minerals [e]

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Aluminum:					
Bauxite [1]	400,000	400,000	400,000	400,000	350,000
Alumina	200,000	200,000	200,000	200,000	175,000
Metal, refined	100,000	100,000	100,000	100,000	80,000
Antimony, mine	15,000	15,000	15,000	15,000	12,000
Bismuth, mine	300	300	300	300	250
Copper:					
Mine	90,000	90,000	90,000	90,000	80,000
Metal, refined	100,000	100,000	100,000	100,000	90,000
Gold, troy ounces	60,000	60,000	60,000	60,000	50,000
Iron and steel:					
Iron ore [2], thousand tons	35,000	37,000	39,000	40,000	28,000
Pig iron, do	17,000	18,000	19,000	20,000	14,000
Steel ingot, do	12,000	14,000	15,000	16,000	11,000
Rolled steel, do	10,000	11,000	12,000	13,000	9,000
Lead:					
Mine	100,000	100,000	100,000	100,000	90,000
Metal, refined	90,000	100,000	100,000	100,000	90,000
Magnesium	1,000	1,000	1,000	1,000	1,000
Manganese ore, thousand tons	1,000	1,000	1,000	1,000	700
Mercury, 76-pound flasks	26,000	26,000	26,000	26,000	20,000
Molybdenum, mine	1,500	1,500	1,500	1,500	1,500
Silver, troy ounces	800,000	800,000	800,000	800,000	600,000
Tin, refined, long tons	28,000	25,000	25,000	22,000	20,000
Tungsten concentrate, about 68 percent WO_3	r 20,000	r 18,000	r 15,000	r 15,000	15,000
Zinc:					
Mine	100,000	100,000	100,000	100,000	90,000
Metal, refined	90,000	90,000	90,000	90,000	80,000
Nonmetals:					
Asbestos	100,000	120,000	130,000	r 140,000	150,000
Barite	80,000	100,000	100,000	r 110,000	100,000
Cement, thousand tons	10,000	10,500	11,000	11,000	8,000
Fluorspar	200,000	200,000	220,000	r 250,000	250,000
Graphite	40,000	40,000	40,000	40,000	30,000
Gypsum	500,000	600,000	600,000	600,000	500,000
Magnesite, thousand tons	900	1,000	1,000	1,000	800
Phosphate rock, do	700	800	900	1,000	1,000
Pyrite, do	1,200	1,300	1,500	1,500	1,500
Salt, do	10,500	10,000	13,000	13,000	13,000
Sulfur	250,000	250,000	250,000	250,000	250,000
Talc	150,000	150,000	150,000	150,000	150,000
Mineral fuels:					
Coal, thousand tons	270,000	290,000	300,000	325,000	225,000
Coke, do	15,000	15,000	16,000	17,000	13,000
Petroleum:					
Crude, do	7,500	8,500	10,000	13,000	11,000
Refinery products, do	7,000	8,000	9,000	12,500	10,000

[e] Estimate. [r] Revised.

[1] Mostly diasporic bauxite. Data shown include only the bauxite for aluminum manufacture; in addition 100,000 to 200,000 tons was produced each year for making refractories.

[2] Converted to equivalent 50 percent Fe ore.

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asbestos and fertilizer raw materials found adequate markets. Externally, fluorspar, steatite, talc, and barite were readily sold in 1967.

In contrast, 1966 had been a banner year overall, with output of iron and steel, coal, petroleum, electric power, chemicals and fertilizers, and building materials (including cement) exceeding targets. The Chinese also claimed that they can make most of the basic capital equipment needed for iron and steel plants, coal mines, oilfields and refineries, chemical and cement plants, and power stations.

Steel and coal each accounted for one-third of the total 1967 mineral production value; and petroleum, nonferrous metals, and cement together made up one-fourth. At yearend 1967, serious efforts were being made to bring mineral output levels back to normalcy.

TRADE

Overall trade volume of mainland China, never much of a trading country, declined slightly from 1966 levels, to possibly $4 billion. A surplus of several hundred million dollars had changed to a deficit because of inability to export. Trade with Eastern Europe, including the Soviet Union, continued to drop in 1967; and trade with the free world (about $3 billion) did not take up all the slack. Minerals and metals, however, remained significant in total trade. Much of mainland China's mineral related trade with the outside world involved export of traditional commodities—selected nonferrous metals, coal, cement, salt, and other nonmetallics, and import of large quantities of fertilizers, modest tonnages of steel products, and some new plant, industrial and mining equipment.

For lack of published trade figures on mainland China, mineral import data on Japan, the U.S.S.R., and Poland are presented in table 2 to show trends. In 1966, these three countries together imported from mainland China about 4,100 metric tons of tungsten concentrate, 1,800 tons of tin, 1,600 tons of antimony ore, 3,000 flasks of mercury, a million tons of salt, 166,000 tons of fluorspar, 47,300 tons of talc and steatite, 44,700 tons of barite, and nearly 900,000 tons each of coal (mostly coking coal, the rest anthracite) and ferrous materials. In the same year, Western Europe also imported from mainland China about 3,200 tons of tin, 8,000 tons of tungsten concentrate, and 40,000 tons of fluorspar, among other minerals, and Hong Kong imported 910,000 tons of cement.

Fertilizer imports constituted an important part of mineral trade. During 1967, roughly 5 million tons was imported—2.6 million from Western Europe and 2.4 million from Japan—valued at nearly $200 million c.i.f. In addition, 750,000 tons of phosphate rock came from Morocco. Petroleum imports, formerly mainly from the Soviet Union, had dwindled to low levels. Steel imports remained important. Japan exported about 610,000 tons of various steel products to mainland china in 1967, valued at perhaps $100 million. During the Canton Trade Fairs, approximately 850,000 tons of steel products was contracted for delivery in 1968, roughly 450,000 tons from Japan and 400,000 tons from West Germany; within the Japanese quota about half represented seamless steel pipe. In 1966–67, the Chinese steel industry started to buy scrap iron from Japan. About 20,000 tons of copper were purchased from Chile in 1967, valued at more than $15 million. Estimated imports in 1966 were 10,000 tons from Chile and up to 40,000 tons from Western Europe. Mainland China continued purchases of gold and platinum in the London market in 1967, after buying 1.6 million ounces of gold in 1966—half the 1965 level.

Importation of mineral-related plants and equipment was significant. During recent years, an Imperial Smelting Process nonferrous plant was contracted from the United Kingdom, oxygen converter units were ordered from Austria, copper and iron mining equipment came from Sweden, fertilizer plants were purchased from the United Kingdom, Italy, and Japan, a West German Lurgi gas plant was being built, and negotiations were underway to obtain a large rolling mill from a European consortium headed by West Germany.

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Table 2.—Mainland China: Exports of selected metals and minerals to Japan, U.S.S.R., and Poland

(Metric tons unless otherwise specified)

Commodity	Japan		U.S.S.R.	Poland
	1966	1967	1966	1966
Metals:				
Antimony ore and concentrate	1,610	2,625	NA	NA
Iron ore	325,288	245,580	--------	--------
Iron, pig	519,392	218,300	NA	--------
Manganese ore	15,682	12,652	--------	10,445
Mercury 76-pound flasks	-------	100	2,000	985
Tin long tons	992	738	490	168
Tungsten concentrate	445	569	3,000	650
Nonmetals:				
Barite	37,680	26,695	--------	6,999
Fluorspar	97,330	129,291	49,700	18,509
Salt	905,779	982,770	99,700	NA
Talc and steatite	25,800	40,010	29,900	1,499
Mineral fuels:				
Anthracite	228,916	190,594	--------	--------
Coking coal	650,846	891,003	--------	--------

NA Not available.

Source: Official trade returns of Japan, the U.S.S.R., and Poland.

COMMODITY REVIEW

METALS

Aluminum.—The Fushun plant in Manchuria, rated at perhaps 80,000 to 100,000 tons of metal yearly, has been the key to Chinese aluminum production. In recent years, the Chinese were seeking European and Japanese help in expanding aluminum facilities.

Antimony.—Antimony production has been in the doldrums, and Chinese output declined further in 1967. Hsikwangshan in Hunan Province was the main production center, but Kwangsi gained in relative significance. China may be the worlds leading antimony producer, but value of this output has remained small.

Bismuth.—Mainland China has long been an important bismuth producer. The bulk of the bismuth, found in association with tungsten and nonferrous metals, was exported.

Chromium.—Chromite was still in short supply. Albania exported 83,500 tons to mainland China in 1964, which is indicative of more recent levels of consumption.

Copper.—Mainland China continued to experience an acute shortage of copper, despite reduced demand resulting from lower levels of industrial activity in 1967. This shortage had prompted the country to turn more to aluminum for electrical use and to make special efforts to explore for copper. Several sizable porphyry copper deposits reportedly had been found in North China. Various overtures have been made to purchase Japanese copper smelters, in order to exploit sizable reserves already delineated. To date, however, no contract has been signed. Eventually, the Chinese should be able to produce considerably more than the 90,000 to 100,000-ton levels attained in recent years.

Iron and Steel.—The Chinese Communists did not claim any records in iron and steel during 1967. In fact, they reported that Revolutionary Committees, made up of PLA, labor and technocrat representatives, and Red Guard, had been organized at most major centers. Swift action by the PLA prevented excessive losses in production and serious damage to facilities. Nevertheless, work disruptions at mines and plants plus serious transport bottlenecks took their toll, and mainland China's steel production declined at least 30 percent in 1967. In contrast, 1966 had been a banner year, with all major steel centers fulfilling targets before the Cultural Revolution struck.

To complement internal achievements and to fill the technical void created by the Sino-Soviet rift, the Chinese Communists had in 1965–66 embarked upon a program of purchasing foreign steel plants

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along with the know-how. The biggest deal to be negotiated was with a European consortium headed by the West German firm DEMAG AG to build a $150 million, 3-million-ton annual capacity steel rolling mill. Negotiations were called off at year-end 1967. The Austrians who were building LD (Linz-Donawitz) oxygen converters at the Taiyuan steelworks had to leave without completing construction, because of the political upheaval. A deal to buy a West German steel tubing plant from Mannesman A.G. was reportedly signed but construction had not yet started by late 1967. The Japanese firm Hitachi Shipbuilding Co. was negotiating to sell a large sintering and pelletizing plant to the Chinese Communists.

Anshan, a large integrated steel center by world standards with 10 blast furnaces ranging in size from 585 to 1,513 cubic meters (or about 2,600 tons per day for the largest) [2] and 25 open hearths, had been capable of producing roughly 6 million tons of steel ingot annually. It managed to escape the worst hazards of the Cultural Revolution until mid-August 1967, when an armed struggle and damage to several blast furnaces was reported. Although order was quickly restored, normal operations had been seriously disrupted. No doubt steel ingot production had dropped to 4 to 5 million tons in 1967. In contrast, Anshan had had a record high year in 1966. It successfully introduced the practice of injecting slurry coal (sometimes also tar and coal gas) and heavy oil under high temperature and pressure at its No. 9 blast furnace to bring coke consumption down to below 400 kilograms per ton of pig. Low-alloy steel was stressed, and the No. 24 open hearth produced more than 1,000 heats of this at one stretch.

The Wuhan steelworks, with 1,386- and 1,436-cubic-meter blast furnaces, five open hearth furnaces (four 500-ton and one 250-ton), three byproduct coke plants, and various rolling mills, had been rated at about 1.5 million tons of steel ingot yearly for its "first stage" capacity. Production had finally hit stride in 1966, but trouble started at the turn of the year and the Revolutionary Committee had to take over. There was another 2-month impasse beginning in July 1967 when the Wuhan military personnel openly defied Peking.

The Shihchingshan-Tangshan-Tientsin-Peiping complex, with an annual capacity of more than 1.5 million tons of steel, had a reasonably good year, because of proximity to the capital. Shihchingshan with three blast furnaces (413, 512, and 963 cubic meters), three coke units, and top-blown oxygen converters, has been the key in this complex. Injection of anthracite dust along with other fuels into blast furnaces, a practice thought hazardous by Westerners and Japanese, has been successfully done at Shihchingshan.

The Paotou steelworks is oriented around a 1,513-cubic-meter blast furnace, possibly two 600-ton open hearth furnaces, and related byproduct coke unit and rolling mills. Operational difficulties were finally smoothed out in 1966 when outputs for most items were said to be 50 to 100 percent greater than in 1965. However, there was also a great deal of strife at Paotou in 1967.

The Taiyuan steelworks was still under construction when the Cultural Revolution began. Five blast furnaces (963 and 291 cubic meters plus three smaller ones) and various steel furances, including open hearths, electric furnaces, and converters had already been installed, whereas some rolling mills probably were not quite finished. This steelworks was "seized" in early 1967, but taken back fairly quickly.

Chungking, with three blast furnaces (the largest being 620 cubic meters) and all the necessary related equipment to make steel products, was another center capable of producing close to 1 million tons of steel annually. A somewhat outmoded plant, Chungking did well in 1966 and was even cited for outstanding performance. It had its share of troubles in 1967.

Shanghai's steel plants must have been as much disturbed as the rest of the city. At least eight little plants were in existence. A number of converters and other steel furnaces had been installed, and Shanghai built its first "homemade" oxygen converters in late 1966. There were only two blast furnaces, however, with a combined annual capacity of perhaps 500,000 tons of pig iron. The Maanshan steelworks in nearby Anhwei may be complementing Shanghai by sending pig iron and steel ingots there. Maanshan with 13 little blast furnaces ranging from 34 to 225 cubic meters in size, recently built a few modern

[2] American Metal Market Mar. 4, 1968, pp. 1, 23.

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open hearth furnaces and a heavy rolling mill. Maanshan was also cited for good performance in 1966. Shanghai and Maanshan together probably can produce 2 to 3 million tons of steel annually, but output in 1967 undoubtedly was much lower.

Lead and Zinc.—A contract was signed with the British firm Imperial Smelting Process, Ltd., in 1966 to use the ISP process in building a lead-zinc plant at Shaokuan, northern Kwangtung. A 30 percent zinc-16 percent lead concentrate from presumably nearby areas will be smelted to produce 35,000 to 40,000 tons of zinc and 18,000 to 20,000 tons of lead annually, respectively roughly 40 and 20 percent of national outputs for recent years. The Chinese have made exchange visits of technicians with the Japanese Sumitomo representatives who have a similar plant. In late 1967, a bid from Sumitomo to build the plant was still under consideration. The uncertainty of the matter meant that completion of the Shaokuan plant was a few years away. Zinc was needed primarily for galvanized sheets, die castings, and brass, and lead for batteries and lead pipes.

Manganese.—Chinese manganese ore output ranked about fifth in the world, even though production dropped sharply in 1967 because of reduced steel smelting activities. Hsiangtan in Hunan, Mukwei and Leiping in Kwangsi, Chin Hsien and Fangcheng in Kwangtung, Tsunyi in Kweichow, and Wafangtzu in Manchuria were the main producers. A small surplus was exported.

Mercury.—Mercury output probably declined sharply in 1967, although the country was still prominent among world producers. Southwest China, particularly Tungjen in Kweichow, produced the bulk. A great change has taken place in sales, with the Soviet Union importing 34,800 flasks of mercury in 1962 and only 2,000 flasks in 1966.

Molybdenum.—The Chinese had not yet fully developed several large molybdenum deposits; however, hundreds of tons of concentrates have been exported yearly for some time from existing mines.

Nickel.—Failure to get some of the nickel contracted from Société Le Nickel of France under a 4-year contract prompted mainland China to make inquiries in West Germany and the Netherlands.

Tin.—The Soviet Union received 17,400 long tons of tin in 1960 and only 500 tons in 1966. Accountable free world imports of tin from mainland China have been 5,000 to 7,000 tons annually in recent years and domestic consumption, roughly the same. This suggests production declines from the Kuchiu (in Yunnan) and Fuhochung (in Kwangsi) centers plus stockpiling.

Titanium.—In 1966, the Chinese were exploring the possibility of purchasing a titanium plant from the Japanese. They have also been interested in titania pigment for some time.

Tungsten.—Chinese tungsten has fared a little better under higher price conditions. In 1960, the Soviet Union imported 18,900 tons of tungsten concentrates from mainland China and, after the Sino-Soviet rift, only 3,000 tons in 1966. Contrasting this, the free world imported about 2,000 tons in 1964, 8,000 tons in 1966, and at least an equal amount in 1967. Domestic consumption may be about 5,000 tons of tungsten concentrates, possibly one-third of 1967 production. Kiangsi Province was still the main source of Chinese tungsten.

Uranium.—China's first fusion-type explosion in mid-1967, again at Lap Nor in Sinkiang Province, followed three successful fission-type nuclear blasts in 1966, two of which may have been warhead devices. Mainland China is believed to have two plutonium reactor plants. However, in the latest test, uranium-235 was used to set off fusion rather than the more conventional plutonium. The processed uranium-235 came from a gaseous diffusion plant near Lanchow in Kansu. Power for the Lanchow plant was furnished by a large hydroelectric facility nearby. By going all out in this very costly nuclear-hydro project based upon uranium-235, mainland China probably shortened its nuclear schedule considerably and assured much lower future costs.

Three new uranium mines were reported to have started production in recent years, with a combined initial daily output of 2,500 tons of ore: Maishan and Chushan in Chuannan of Kiangsi, and Hsiachuang in Weiyuan of Kwangtung. The Czechs gave technical and financial assistance to the Chinese in building necessary beneficiation and processing facilities at Chuchou

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in Hunan. Instead of paying cash, the Chinese gave the Czechs some of the processed uranium.

Other Metals.—Various kinds of rare-earth metals and alloys for use in the optical, metallurgical, and nuclear energy industries were produced at Chinchow in Manchuria and elsewhere. The China National Metals and Minerals Import and Export Corporation was offering gallium and selenium of 99.99 percent purity for export.

NONMETALS

Asbestos.—Production of asbestos—mainly good grade, long fiber, chrysotile type—continued to increase in mainland China and may reach the 200,000-ton level in a few years. In 1967, the country provided perhaps 4 percent of the world's asbestos and ranked fourth or fifth as a world producer. Bulk of the output came from Shihmien (literally means asbestos) in Szechuan Province, where a dozen new projects were completed not long ago and a new large and high-grade orebody was reportedly discovered. Chinese and Canadian asbestos experts have exchanged visits in recent years, and the Chinese were interested in buying Canadian beneficiation equipment for Shihmien. Most of the asbestos is domestically consumed, but some has been exported.

Barite.—Barite production was down slightly but still 2 to 3 percent of the world total. This industry has good potential, and output can be expanded considerably above the 100,000-ton annual level to meet domestic oil drilling needs and export demand. Japan imported 8,902 tons of barite in 1965, 37,680 tons in 1966, and 26,695 tons in 1967; and Poland imported 5,000 to 8,000 tons annually in recent years.

Boron Minerals.—A surplus of borax continued, although no information was available on the extensive boron bearing lake deposits in the Iksaydam area of Tsaidam, Tsinghai Province.

Cement.—Cement production dropped substantially below the 10-million-ton level in 1967, after a fairly successful year in 1966 when target fulfillment was claimed. The whole cement economy was badly disrupted by the Cultural Revolution, from raw materials to production, distribution, and consumption. An important indication of developments within China was that imports by Hong Kong—the main purchaser of surplus Chinese cement—declined from 910,000 tons in 1966 to 475,000 tons during the first 11 months of 1967.

More than half of the approximately 50 large and medium-sized cement plants (100,000-ton to 1-million-ton annual capacity) were mentioned in the Chinese press during 1963–66 and it was claimed that more than a dozen modern plants (200,000 to 700,000 tons) and some 100 small plants (usually considerably below 100,000-ton size) had been built during this period. Some of the larger newly built plants are Tatung in Shansi, Kunming in Yunnan, Yao Hsien in Shensi, Yungteng in Kansu, Chungking in Szechuan, Kwangchow in Kwangtung, Liuchow in Kwangsi, Kweiyang in Kweichow, Mutanchiang in Kirin, and Nanping in Fukien.

In contrast, few claims were made in 1967 and none for the country as a whole. A plant in Kwangsi, presumably Liuchow, virtually completed expansion from 300,000 to 600,000 tons. The Chihsin plant in Hopeh produced at record levels after installing a better dust collecting system. The Urumchi cement plant in Sinkiang did well in early 1967. The Tsinan cement plant in Shantung produced more in 1967 than in 1966—a rare claim. A sizable cement plant was mentioned for Llasa in Tibet. A 300,000-ton kiln—a Chinese record—was constructed by the Lanchow Petrochemical Machinery Plant in 1967.

Diamond.—It was reported in mid-1967 that a metallurgical plant in Tsingtao had successfully produced synthetic diamonds, presumably on an experimental basis.

Fertilizer and Chemical Materials.—The chemical fertilizer industry was badly disrupted in 1967. Among other things, construction of many new plants was seriously delayed. In 1966–67, considerable emphasis had been placed on producing nonsulfur fertilizers, such as synthetic ammonia, urea, ammonium carbonate, potassium fertilizers, and ground phosphate rock. For example, a 45,000-ton synthetic ammonia plant was completed in Tsinan, Shantung Province. Ammonium carbonate plants were built in Hunan, Hopei, and Nignhsia Provinces, among others. A large mixed potassium fertilizer plant was constructed in Canton.

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The Chuchow plant in Hunan reportedly placed a 200,000-ton "calcium phosphate" (presumably ground phosphate rock) unit in production.

Imports of fertilizer in 1967 were nearly of the same magnitude as production. Mainland China contracted for roughly 5.9 million tons of nitrogenous fertilizer from Western Europe and Japan for delivery in 1967. Nitrex A.G., a Swiss firm heading a European consortium of nitrogenous fertilizer producers and exporters, contracted to deliver 3.5 million tons at about $38 per ton c.i.f. The Japanese Ammonium Sulphate Export Association signed for delivery of 2.4 million tons at about $40 c.i.f. Additional imports came from the United Kingdom and Italy. The closing of the Suez Canal and the harbor confusion in coastal China resulted in a reduction of actual imports from Europe to approximately 2.6 million tons. In addition, China imported about 750,000 tons of phosphate rock from Morocco in 1967. A fertilizer plant bought from Humphreys and Glasgow, Ltd., of the United Kingdom for Luchow near Chungking was reportedly completed. Fertilizer plants had also been purchased from Italy (Montecatini) and Japan, among others.

The supply position of fertilizer raw materials did not show much change. Pyrite production of perhaps 1.5 million tons came mainly from Hsiangshan in Anhwei and Yingte in Kwangtung. This and byproduct sulfur from nonferrous ores were used in sulfuric acid manufacture. Additional pyrite was produced in Szechuan and Shansi Provinces, but the output is not included in this estimate in that this pyrite was converted to about 250,000 tons of elemental sulfur, a part of which was ultimately exported. Phosphate rock production was approximately 1 million tons in 1967, coming mainly from Chinghsiang in Hupeh, Kaiyang in Kweichow and, to a lesser extent, Liuyang in Hunan and Nantung in Kiangsu. Mainland China not only imported phosphate rock, but also some apatite from Laokay, North Viet-Nam.

Fluorspar.—Chinese fluorspar production was perhaps 7 to 8 percent of the world total. Output from Chekiang and North China remained steady, but Kwangsi Province has become a significant new source. The bulk of the fluorspar is exported. During 1966, importing countries gave the following figures, in metric tons: Japan 97,330 (129,291 in 1967), U.S.S.R. 49,700, West Germany 22,618, Poland 18,509, Netherlands 9,968, Sweden 5,549, and Belgium 2,217. The Kamisho Co. of Tokyo contracted all fluorspar imports from mainland China for Japan. Within China, fluorspar was consumed in the manufacture of steel, aluminum, and ceramics, and in uranium processing.

Magnesite.—Southern Manchurian magnesite found in a belt extending from Tashihchiao northeast to Lienshankuan continued to be of great world significance. Output in 1967 probably was down from the million-ton level in recent years, because of the reduced requirements of the steel industry. Anshan Steelworks has pioneered the use of magnesia-alumina refractory bricks for iron and steel smelting in China. Large amounts of magnesite and calcined magnesia have been traditionally available for export.

Salt.—Mainland China retained its position as the world's second largest producer of salt, after the United States. The national target was achieved 20 days ahead of schedule, and output in 1967 probably was of the same magnitude as the last few years. Operating conditions were good for the four main producing provinces—Kiangsu, Shantung, Hopeh, and Liaoning—that furnished nearly three-fourths of the country's total output. Although most salt was consumed for food purposes, industrial demand was rising. Also salt traditionally has been exported, mainly to Japan; in 1967, mainland China's total salt exports was considerably in excess of 1 million tons and constituted roughly one-tenth of production. The Chinese salt industry produced many byproducts, such as potassium chloride, bromine, boric acid, iodine, and barium chloride.

Steatite and Talc.—Chinese steatite and talc from Taling in Liaoning Province are world famous. Somewhere between one-third and one-half of the 1967 output was exported, with Japan the main purchaser taking 22,742 tons of steatite and 17,268 tons of talc.

MINERAL FUELS

Coal.—The year was marked by many open clashes and rival rallies pitting the miners and technocrats against the Red Guard. By mid-1967, PLA units either

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had been or still were stationed at most major Chinese coal mining centers. Aside from internal production difficulties, the coal industry also faced a crippling transportation bottleneck in its effort to deliver coal to consumers and obtain equipment and supplies for operations. Inability to move coal caused shortages in many regions prompting Peking to organize a nationwide campaign to conserve coal.

National coal output was down about 100 million tons as compared with that of 1966 or roughly 30 percent, but the country still ranked third among world producers. Performance during the first half of 1967 was particularly bad, but considerable improvement took place in the second half. Production may return to normal shortly if law and order can be maintained. Mainland China has always been noted for extensive and well distributed reserves of easily minable, good quality coal.

The seven leading coal mines—Fushun, Fuhsin, Kailan, Huainan, Hokang, Chihsi, and Tatung—that normally produce a combined 100 million tons annually suffered the least dislocation because of their proximity to authority in Peking. Even so, most, including Fushun, Kailan, Huainan, and Chihsi, went through a brief cycle of clashes and PLA occupation. A report that Fushun output had declined 30 percent in 1967 clearly points out a considerable drop in production for the leading mines. The several dozen medium-sized coal mines of 1 to 9 million tons yearly capacity also suffered serious work disruption. As an extreme example, the new model Pingtingshan Coal Mine in Honan went through 6 months of "civil war" between the usual two factions before the PLA stepped in. The Chiaotso Anthracite Mine nearby went through a strike in early 1967. Nevertheless, a few large and many medium mines such as Fuhsin, Kailan, Chihsi, Shuangyashan, Penhsi (Penchi), Tzupo, Tsaochuang, and Chinghsing, reported good production performance during 1967 despite political disturbances. The small mines in faraway areas were the hardest hit from prolonged work stoppage and transportation tie-ups.

Capital construction nearly came to a standstill in 1967, with few reports of such activities. Some new coal mines or shafts opened during the year included: an open pit mine near Chengchow, Honan; a modern shaft coal mine in Tatung, Tsinghai; a new colliery at Sinwen, Shantung; and a new open pit mine in Fushun, Manchuria. These were completed with previously committed funds, and there was no mention of new investments planned in 1967.

Petroleum.—The year 1967 was one of confusion for petroleum, although decline in output was not as great as in other major industries. This compares with 1966 which was a record high year in output and one that the Chinese Communists claimed self-sufficiency in supply. Political upheavals did not spare petroleum, and supreme efforts were made to restore order and normal operations. It was claimed that the country's oil production in the first 9 months of 1967 topped the corresponding period in 1966, but this statement clearly can be discounted when individual fields are reviewed.

Taching, northwest of Harbin in Manchuria, remained very much in the news, and overall progress no doubt received a severe jolt by events in 1967. In January 1967, the Premier publicly denounced the 10,000 Red Guard workers who had gone to rallies in Peking. After some work stoppage, the PLA was sent in to take control. Trouble erupted again in August when thousands of anti-Maoists engaged Maoists in open conflict. Again, the PLA moved in swiftly. With a large refinery complex and successful drilling and water injection practices, Taching had expanded its output to perhaps 5 million tons in 1966. The Institute of Petroleum Industry was transferred to Taching to assist in technology.

There was little additional news about the promising Shengli (Victory) field in Shangtung, possibly located near the mouth of the Yellow River. This new field may rival Taching in potential, and might already be capable of producing 3 million tons of crude oil annually. Proximity of Shantung to Peking and no reports of conflict among the factions lead to the conclusion that exploration, development, and production activities moved forward at Shengli without notable disruption in 1967.

In late May 1967, armed clashes were reported in Sinkiang between the local military forces and Mao supporters. As a result, operations at Karamai oil complex (oilfields and refinery at Karamai and another refinery at Tushantzu) were

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suspended and regular oil deliveries to Lanchow were interrupted. PLA units loyal to Peking quickly quelled the armed clashes and restored oil production in Sinkiang. The uneasy truce was maintained for the rest of 1967 so that Sinkiang's oil production may have kept pace with 1966. The Karamai complex reportedly registered a 2.6-fold output increase over a 3-year period up until 1966 when many new projects were substantially completed. Annual production of perhaps 2 million tons was achieved through drilling new oil wells, rejuvenating abandoned wells, and improving the spacing of wells.

In August 1967, a Japanese newspaper reported that Lanchow was paralyzed by armed struggle and oil refining was suspended for a month. The nearby Yumen oilfields, which probably produced more than 2 million tons of crude in 1966, also had "bloody clashes." Yumen has a refinery but has traditionally shipped surplus crude to Lanchow.

The general confusion in Shanghai and Szechuan must have affected their oil refining and gas operations, respectively. Shanghai not only has a large refinery with thermal cracking and platforming (Chinese design) units, but has also become an important center for producing oil refining and drilling equipment. The famous Fushun coal mine in Manchuria stopped production of coproduct shale oil at least temporarily, possibly because of the competition of surplus natural crude oil from Taching and Shengli which the Fushun shale oil refinery might be processing. The Mowming shale oil project in Kwangtung probably was abandoned before it even got started.

Mainland China has started to look into offshore exploration and drilling for oil. Since South China is short of oil, offshore work might have commenced along the coast of Kwangtung and Hainan. In 1967, equipment of this type was purchased from West Europe and Rumania. Rumania in particular has been assisting China, both in furnishing exploration, production, and refining equipment and in providing technical aid, offshore and onshore.

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The Mineral Industry of Colombia

By Gordon W. Koelling [1]

The total volume of Colombia's crude mineral production declined almost 2 percent in 1967 compared with a 4-percent drop during the preceding year. This declining trend resulted, in part, from a decrease in crude oil output as the country's older oilfields became depleted. Other factors partly responsible for the poor performance of the mining sector were the lack of price incentives, insufficient technical knowledge applied to production processes, the lack of credit, and inadequate legal and administrative mechanisms for the granting of mining claims. Crude mineral production probably accounted for only about 3 percent of the country's 1967 gross domestic product (GDP) which was estimated at $5,820 million (at current prices), 4.8 percent greater than that of 1966.

Colombia continued to be the world's principal source of emeralds, ranked about 10th among gold producers, and was one of the few world producers of platinum, but output of these commodities was less important to the country's economy than the production of such items as crude oil, coal, iron ore, limestone, cement, and salt.

The National Minerals Inventory, initiated under a loan agreement with the U.S. Agency for International Development (AID) in September 1965, progressed toward completion during 1967. Completed maps and reports resulting from the program were scheduled for publication by September 1968. The Ministerio de Minas y Petróleos submitted an application to AID requesting the financing of a followup project for surveying the mineral potential of an area extending along the Cordillera Central of the Andes from southern Caldas to the Ecuadorian border.

In November 1967, the Colombian Government established new rates for most exchange transactions of the petroleum industry in order to revitalize foreign petroleum investment. The special petroleum exchange rate of Col$7.67 (pesos) per US$1, which had been in effect for several years, was considerably lower than the official rate of exchange. This practice, which was essentially equivalent to the levying of a surtax on foreign investments, was partially responsible for the slow but steady withdrawal of most international firms from the Colombian petroleum exploration scene.

Under the new exchange rules, the official rate (Col$16.25 per US$1) was established as the exchange rate for investments and expenditures in petroleum exploration, production, refining, transportation, and distribution. This rate was also made applicable to income tax payments. In order to avoid sudden increases in domestic fuel prices, the new regulations required that 25 percent of all crude oil produced in Colombia be sold to local refiners for peso payment with the fixed dollar price of crude converted at the rate of Col$9 per US$1.

The first new mining law enacted by the Colombian Congress in more than 25 years was signed by the President near yearend 1967. This law specifies that minerals should be partially or totally processed in the country, whenever possible, and special preference should be given to supplying domestic needs. The Ministerio de Minas y Petróleos, with prior agreement of the affected parties, may stipulate royalties and shares not specifically established by law, increase payments established by law, and restrict the limits of exploration and exploitation.

The law gives the Government the right to declare any part of the country a national reserve for the purpose of "freezing" any mineral reserves which are in the proc-

[1] Geographer, Division of International Activities.

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ess of being awarded, or in order to set them aside pending special investigation.

A decree issued prior to the passage of the new mining law, but which now serves as a regulatory decree for this law, established two systems for awarding mining claims. Under one system, the Ministerio de Mines y Petróleos may cede claims to other official entities which may assume total responsibility or may form mixed enterprises of private and public participants. Concessions may also be awarded to private entities, through a process of public bidding, under 30-year-lease contracts extendable for an additional 10 years.

PRODUCTION

Total crude mineral output continued to decline during 1967 as shown in the following tabulation:

	Index of physical volume of production (1958 = 100)		
	1965	1966	1967
Crude oil	156.1	153.3	147.9
Metals	90.1	82.4	80.0
Nonmetals	152.5	145.5	164.0
Total	146.5	140.9	138.5

Source: U.S. Embassy, Bogotá. State Department Airgram A-732, May 2, 1958.

In contrast to declining crude mineral production, output of pig iron increased 22 percent, that of steel ingots and castings was up 16 percent, and output of refinery products rose 13 percent in 1967.

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Table 1.—Colombia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967 [p]
Metals:					
Antimony concentrate	30	--	--	--	NA
Chromite	110	400	260	--	NA
Gold, thousand troy ounces	325	365	319	[r] 281	258
Iron and steel:					
Iron ore, thousand tons	695	[r] 710	706	662	NA
Pig iron, do.	202	205	204	169	207
Steel ingots and castings, do.	222	230	242	217	252
Lead concentrate	500	806	730	948	NA
Mercury, 76-pound flasks	3	3	46	84	[e] 100
Platinum, crude, thousand troy ounces	23	21	11	NA	NA
Silver [2], do.	106	[r] 131	[r] 116	[r] 109	110
Zinc:					
Ore and concentrate	600	710	400	804	NA
Slab	--	--	--	--	NA
Nonmetals:					
Barite	10,500	10,200	8,800	[e] 9,000	NA
Cement:					
Portland, thousand tons	1,810	1,940	[r] 2,848	2,202	NA
White, do.	25	32	35	26	NA
Total, do.	1,835	1,972	[r] 2,883	2,228	2,116
Clays:					
Kaolin, do.	75	81	83	26	NA
For cement, do.	360	360	420	753	NA
For construction, do.	NA	NA	1,300	NA	NA
Other industrial use, do.	110	112	117	631	NA
Diatomite	2,200	231	200	--	NA
Dolomite	5,100	3,217	11,704	6,480	NA
Emerald:					
Gem, thousand carats	51	[e] 55	42	[e] 35	NA
Moralla, do.	2,004	[e] 214	403	294	NA
Feldspar, thousand tons	13	12	11	19	NA
Gypsum, do.	102	108	112	115	NA
Lime, do.	97	100	108	[r] 50	NA
Limestone, do.	3,400	4,273	3,890	3,231	NA
Magnesite	250	220	190	[e] 190	NA
Marble, cubic meters	800	650	1,700	1,000	NA
Quartz, quartzite, industrial sand, thousand tons	130	135	150	9	NA
Salt:					
Terrestrial, do.	265	289	280	[r] 301	310
Marine, do.	34	51	[r] 51	[r] 81	159
Total	299	340	[r] 331	[r] 382	469
Sulfur	13,000	12,134	18,405	20,980	NA
Talc	650	730	400	1,195	NA
Mineral fuels:					
Coal:					
Anthracite	NA	[3] 2,000	NA	NA	NA
Bituminous, thousand tons	3,200	3,000	3,100	[e] 3,000	3,100
Coke, do.	400	420	[4] 470	323	NA
Natural gas, million cubic feet	82,979	84,687	[r] 93,823	[r] 98,096	99,920
Natural gas liquids, thousand 42-gallon barrels	1,392	1,658	[r] 1,636	[r] 2,079	2,914
Petroleum:					
Crude, do.	60,343	62,596	[r] 72,670	71,430	68,877
Refinery products:					
Aviation gasoline, thousand 42-gallon barrels	566	540	786	784	746
Motor gasoline, do.	10,858	11,312	12,377	13,132	13,277
Jet fuel, do.	153	195	244	396	526
Kerosine, do.	1,809	1,793	1,940	2,102	2,540
Distillate fuel oil, do.	4,075	4,123	4,437	4,849	5,629
Residual fuel oil, do.	9,193	8,742	10,884	12,157	14,904
Lubricants including greases, do.	140	372	448	480	415
Liquefied petroleum gas, do.	356	485	837	606	862
Other, do.	2,318	4,375	2,889	2,875	3,318
Total, do.	29,468	31,937	34,842	37,381	42,217

[p] Preliminary. [r] Revised. [e] Estimate. NA Not available.

[1] In addition to reported commodities, Colombia is known to produce ammonia, carbon black, and phosphate, but data are not available on the output of these items.

[2] Reported by Banco de la República as precious metal refinery output.

[3] Exports.

[4] Includes 35,000 tons of coke breeze.

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TRADE

Complete, detailed official trade figures have not been published by the Colombian Government for years subsequent to 1964. However, some data for 1965 and 1966 were provided by U.S. Embassy, Bogotá, and the Statistical Office of the United Nations.

The value of Colombia's mineral commodity exports during 1966 was more than 13 percent less than in 1965. Petroleum, principally in the form of crude oil, accounted for 90 percent of the 1966 total. The value of 1966 mineral commodity imports, about 47 percent of which was acounted for by iron and steel, was almost 77 percent above the 1965 figure. Approximately 44 percent of the country's 1966 exports went to the United States, which was the source of 33 percent of Colombia's mineral commodity imports. Other important export markets for Colombia's mineral commodities were Trinidad and Tobago and the United Kingdom; important sources of imports included Japan, Canada, and West Germany. The following tabulation shows the role of mineral commodities in the overall foreign trade of Colombia:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	103,736	539,144	19.2
1966	90,129	507,591	17.8
Imports:			
1965	63,081	453,506	13.9
1966	111,622	674,146	16.6
Trade balance:			
1965	+40,655	+85,638	XX
1966	−21,493	−166,555	XX

XX Not applicable.

Source: Statistical Office of the United Nations.

Table 2.—Colombia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum and alloys:			
Ingots, castings, and plates	5	6	NA.
Waste and scrap	4	2	NA.
Semimanufactures	72	135	Ecuador 93; Guatemala 22.
Copper, waste and scrap	16	10	NA.
Iron and steel:			
Semimanufactures	1,122	1,427	Mostly to Venezuela.
Scrap	-------	100	All to Netherlands Antilles.
Lead:			
Ore	756	1,175	All to United States.
Ingots and other primary forms	229	---------	
Ores and minerals, not further specified	12	15	NA.
Nonmetals:			
Cement	189,136	181,325	United States 86,423; Brazil 31,066; Peru 19,711.
Clay and clay products:			
Kaolin and other clays	453	29	NA.
Common brick	99	20	NA.
Refractory products	1	122	NA.
Diamond, industrial ---carats	-------	40	NA.
Fertilizer materials, manufactured:			
Ammonia	37,155	43,448	United States 36,381; Costa Rica 7,067.
Mineral fuels:			
Coal, all types	1,280	814	Mainly to Venezuela.
Coal tar and mineral pitch	21,896	25,705	All to Argentina.
Petroleum:			
Crude--thousand 42-gallon barrels	40,682	35,575	United States 14,564; Trinidad 10,376; United Kingdom 7,872.
Refinery products:			
Motor gasoline ---do	82	175	All to Mexico.
Distillate fuel oil ---do	64	289	United States 162; Panama 127.
Residual fuel oil ---do	4,942	5,677	United States 3,589; Peru 1,464.
Asphalt ---do	132	154	All to Argentina.

NA Not available.

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Table 3.—Colombia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	9,199	9,009	NA.
Alumina	274	226	United States 141; West Germany 64.
Metal and alloys:			
Ingots, castings, and scrap	3,925	8,723	United States 3,962; Canada 3,842.
Semimanufactures	765	1,422	United States 488; Japan 380; Switzerland 197.
Antimony and alloys, unwrought	25	25	NA.
Copper:			
Copper sulfate	-------	47	NA.
Ingots and other primary forms:			
Unalloyed	2,503	4,756	NA.
Alloyed	2,825	1,358	NA.
Semimanufactures	1,369	869	NA.
Iron and steel:			
Iron ore	-------	339	France 316.
Pig iron and scrap	6,441	11,511	Mainly from United States.
Ferroalloys	2,746	3,528	Chile 2,000; Canada 452; Argentina 449.
Ingots, blooms, and billets	25,811	35,708	France 15,532; Venezuela 10,199; Belgium-Luxembourg 9,758.
Semimanufactures	107,529	124,517	NA.
Lead:			
Ingots and plates	471	2,585	Mexico 963; United States 923; Peru 318.
Semimanufactures	36	18	NA.
Litharge	641	1,121	Mainly from Mexico.
Magnesium and alloys, unwrought	25	34	Canada 22; United States 9.
Mercury, 76-pound flasks	10	6	United States 2; West Germany 2.
Nickel:			
Ingots and anodes	55	69	Mainly from United States.
Castings and forgings	8	27	NA.
Semimanufactures	208	317	NA.
Silver, troy ounces	4	3	NA.
Tin and alloys, long tons	109	277	West Germany 74; United Kingdom 59; Malaysia 46; United States 44.
Zinc	2,585	7,826	Mexico 3,913; United States 1,523; Japan 1,334.
Other ores and minerals	235	121	NA.
Other metals and alloys	76	36	NA.
Nonmetals:			
Abrasives, not elsewhere specified:			
Crude	255	321	NA.
Grinding stones and wheels	232	136	West Germany 40; Brazil 39; Mexico 15.
Asbestos, crude	9,063	16,534	Canada 10,545; Republic of South Africa 3,651.
Barite and witherite	54	11	NA.
Borax, refined	178	180	NA.
Cement	703	435	West Germany 148; United States 100; France 93.
Clay and clay products:			
Bentonite	1,864	3,117	Mainly from United States.
Kaolin	2,035	4,729	Do.
Other, crude, calcined, washed, or ground:			
Refractory	17	15	NA.
Nonrefractory	12	164	NA.
Refractory brick, all types	4,916	1,075	NA.
Cryolite	5	3	NA.
Dolomite	2,089	3,559	Mainly from Belgium-Luxembourg.
Feldspar and fluorspar	282	19	NA.
Fertilizers:			
Nitrogenous	7,634	22,154	United States 9,521; Netherlands 5,069; Mexico 5,000.
Phosphatic	28,808	28,148	NA.
Potassic	42,084	54,374	United States 34,733; West Germany 5,860.
Mixed	2,204	61,318	United States 46,498; Netherlands 9,978.
Graphite	57	113	United States 57.
Gypsum	10,581	4,587	Jamaica 3,801; United States 721.
Infusorial earth	1,167	945	Mexico 445; United States 421.
Lime	45	27	NA.
Magnesite	55	81	Mainly from West Germany.
Mica:			
Crude	85	134	Mainly from United States.
Worked	17	22	Do.

See footnotes at end of table.

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Table 3.—Colombia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Pigments, mineral	313	452	Spain 179; West Germany 168; United States 53.
Quartz, ground	324	113	NA.
Salt	4	84	NA.
Sand	94	4	NA.
Slate	203	158	Mainly from Spain.
Sodium carbonate	8,709	25,463	NA.
Sodium hydroxide	20,368	43,077	United States 17,988; Netherlands 8,299; France 6,829; West Germany 5,245.
Sulfur	3,196	67	All from United States.
Talc and steatite	1,005	968	United States 400; Brazil 334; Italy 187.
Mineral fuels:			
Carbon black	5,842	5,717	Mainly from United States.
Coal, anthracite	14	---	
Other fossil hydrocarbons, solid:			
Gilsonite	59	260	East Germany 150; West Germany 80.
Ozokerite and montan wax	160	383	NA.
Mineral tars and products	9	---	
Petroleum refinery products:			
Avia- thousand 42-gallon barrels	103	87	Mainly from Netherlands Antilles.
tion gasoline			
Kerosine and jet fuel ---do---	4	9	Mainly from United States.
Distillate fuel oil ---do---	28	19	NA.
Lubricants, including greases ---do---	64	37	Mainly from United States.
Vaseline and paraffin ---do---	166	263	NA.
Other ---do---	19	16	NA.

NA Not available.

COMMODITY REVIEW

METALS

Gold.—Gold output during 1967 declined for the third consecutive year. Labor problems and rising costs were the principal reason for the 29 percent decline since 1964. Almost 77 percent of the 1967 gold output was produced by a consortium of five companies. Four of these were wholly owned subsidiaries of the International Mining Corp. (United States) which also owned a controlling interest in the fifth, Pato Consolidated Gold Dredging, Ltd.

Production of gold during 1967 by wholly owned subsidiaries of International totaled 109,000 troy ounces, of which 71,000 ounces were from the country's only underground gold-mining operation at Frontino. During July this mine was affected by an earthquake which caused severe underground fracturing and doubled the normal flow of water into the workings. Additional pumping equipment to handle the increased volume of water was installed by yearend. The placer-mining operations of International's wholly owned subsidiaries involved the use of four dredges. These dredged a total of 16,475,000 cubic yards of materials from which 38,000 troy ounces of gold was recovered.

Pato Consolidated Gold Dredging, Ltd., operated a fleet of five dredges which dug 26,606,000 cubic yards during the year. Approximately 80,000 troy ounces of gold was recovered from this material.

In March 1967, the Government issued a decree stating that only the Banco de la República could purchase, sell, possess, and export gold. A resolution implementing this decree established a purchase price of $35 per troy ounce, with 50 percent of the sales value payable in U.S. dollars for expenditures abroad and the remittance of profits and 50 percent payable in pesos at the rate of Col$16.25 per US$1. In addition, a 15 percent incentive bonus in the form of freely negotiable tax credit certificates was made payable to the producer at the time of purchase.

Iron and Steel.—All of Colombia's pig iron output was produced by Acerías Paz del Rio, S.A., from iron ore supplied from its own mining operations. The same company also accounted for 82 percent of total steel ingot and castings output. Three small producers, Empresa Siderúrgica de Medellín, S.A., Empresa Siderúrgica del Pacífico, and Empresa Siderúrgica del Muña, accounted for the remainder.

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Acerías del Rio's first-stage plant-expansion program, aimed at increasing production and eliminating operational imbalance and inefficiency, neared completion at yearend 1967. Plans for a second-stage expansion program, designed to raise annual finished steel production capacity from 220,000 tons to 500,000 tons, were stalled as a result of difficulties in obtaining financing.

Two of the smaller steel companies were also in the process of expanding facilities during 1967. Empresa Siderúrgica de Medellín was installing a 60,000-ton-per-year tinplate plant, and Empresa Siderúrgica del Pacífico was in the process of increasing its total steel output capacity by 20 percent. Both of these expansion programs were scheduled for completion during 1968.

Mercury.—The country's largest mercury production facilities commenced operations at Aranzazu in the Department of Caldas around the beginning of 1967. It was estimated that the plant at Aranzazu would be able to produce about 300 flasks of mercury metal per month. The operating company is Compañía Minera Nueva which is owned by Consorcio Minero Colombiano of Bogotá and the Southern Union Production Co. of Dallas, Tex.

Nickel.—Geologists of the Colombian Government, The Hanna Mining Co. (United States), and Standard Oil Co. of California, confirmed the existence of extensive lateritic nickel deposits near Cerro Matoso in the Montelíbano district. Negotiations were under way which could lead to the establishment of open-pit mining facilities and a nickel smelting plant with an annual capacity of 11,300 tons of ferronickel by the two U.S. companies.

The Ministerio de Mines y Petróleos announced that the Montelíbano deposits contain an estimated 80 million tons of ore averaging 2 percent nickel.

Platinum.—Compañía Minera Chocó, a wholly owned subsidiary of International Mining Corp., produced almost 11,000 troy ounces of platinum along with the gold output from its placer operations during 1967. Owing to the extensive contraband trade in unrefined platinum, data on Colombia's total output were not available. It was estimated that up to 50 percent of total platinum production was smuggled out of the country.

Silver.—Most of Colombia's silver output was from the underground gold and silver mine at Frontino which was operated by a subsidiary of the International Mining Corp. This company reported 1967 silver production of 149,000 troy ounces, 15 percent more than it reported for 1966. However, official 1967 figures published by Banco de la República for precious metal refinery output of silver show a total of only 110,000 troy ounces, 1 percent over the quantity reported by the Banco for 1966.

NONMETALS

Cement.—By year end 1967, Colombia had 14 cement plants with a combined capacity of 3 million tons per year. Included in this total was the plant at Toluvieja, scheduled for completion by the end of the year. This plant, financed by the Corporación Financiera Colombiana Desarrollo Industrial, was to have an initial capacity of 240,000 tons annually.

Fertilizer Materials.—Amoníaca del Caribe (AMOCAR), owned by International Petroleum (Colombia), Ltd. (INTERCOL), a subsidiary of Standard Oil Co. (New Jersey), accounted for almost all of the country's ammonia production at its Mamonal petrochemicals plant. Most of this plant's output of ammonia and nitric acid produced from ammonia was supplied to the Abones Colombianos fertilizer plant, also located at Mamonal. AMOCAR's remaining ammonia output was exported.

The Barrancabermeja fertilizer plant of Fertilizantes Colombianos (FERTICOL), which had been closed since late 1965, was partially reactivated as the result of an agreement with Petroquímica del Atlántico. Terms of this agreement called for the latter company to rent the FERTICOL facilities for from 3 to 5 years and to invest approximately US$4 million in plant renovation and equipment installation. Accordingly, a preassembled ammonia unit, manufactured by Girdler Co. of Louisville, Ky., was shipped to Barrancabermeja during the first half of 1967 and put into operation at the rate of 40 tons per day in July. Petroquímica del Atlántico hoped to have the FERTICOL plant's urea facilities

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in operation by the end of 1967 and also planned to recondition the nitric acid and ammonium nitrate units as soon as possible.

The La Cascajera phosphate mine at Turmequé in the Department of Boyacá was opened by the Instituto de Fomento Industrial (IFI) during the first half of 1967. Initial production from this mine was at the rate of 70 tons per day. Recoverable reserves at Turmequé were estimated at 4 million tons of apatite with an average P_2O_5 content of 14 percent.

A phosphate mine being developed by IFI at Azufrada in the Department of Santander was scheduled to begin operations during the first half of 1968 with the level of production expected to reach 80 tons daily by yearend. This deposit's reserves were estimated at 1 million tons with an average P_2O_5 content of 24 percent.

Salt.—The discovery, by the National Mineral Inventory, that the salt deposits at Zipaquirá were not part of a vast salt dome intruded vertically from a great depth as had been believed, but are of limited extent, spurred the search for additional salt reserves in the Cundinamarca area. Increased salt output from the seawater evaporation operations at Galerazamba and Manaure provided the principal raw material for operation of the country's second alkali plant, which went into production at Mamonal in May 1967. This plant, operated by the Banco de la República as a part of its salt industry monopoly, had the capacity to produce 600 tons of sodium carbonate and 230 tons of sodium hydroxide daily.

MINERAL FUELS

Carbon Black.—The capacity of the Mamonal carbon black plant of Cabot Colombiana, a subsidiary of the Cabot Corp. of Boston, was increased to 6,500 tons annually in early 1967. This plant continued to account for all of the country's output of carbon black.

Coal and Coke.—Proved coal reserves totaled 12.5 billion tons at yearend. Production continued to be concentrated in the Departments of Cundinamarca and Boyacá, which together accounted for approximately two-thirds of the country's total output. The only major washery functioning in Colombia during the year was that operated by Acerías Paz del Rio. This same company was the principal producer and consumer of metallurgic coke.

Petroleum and Natural Gas.—Crude oil output in 1967 was almost 4 percent less than during 1966 and more than 5 percent below the production record set in 1965. Deliveries of crude oil to refineries increased 11 percent during 1967, but crude exports fell 16 percent. The decline in crude oil production resulted from the steady depletion of Colombia's older oilfields coupled with the failure to develop adequate new production. Crude oil output is expected to continue its moderate decline until the Orito field in the southern part of the country is brought into production, an event expected to occur in late 1968 or early 1969.

In contrast to declining crude oil production, output of natural gas continued to rise, increasing about 2 percent during 1967. In a number of cases, most of the natural gas produced was from oilfields where gas/oil ratios have been rising steadily in conjunction with reservior depletion. Production of natural gas liquids also continued to rise.

Early in the year, the Ministerio de Minas y Petróleos called for bids on 200,000 hectares of reverted oil lands in the Departments of Bolívar, Córdoba, and Sucre. No bids were submitted in response to the Ministry's announcement, partly because Decree 755 of March 1966, which authorized new contracts covering reverted lands, calls for higher royalties than those charged for new areas and the payment of a fixed fee for each contract.

Only 38 wells were drilled during 1967 as compared with 52 in 1966. Total footage drilled declined from 369,069 during 1966 to 241,119 in 1967. However, predictions were that the improvements which occurred in the petroleum investment climate in late 1967 might lead to a doubling of drilling activity in 1968.

Only one of the exploratory wells drilled during 1967 was completed as a crude oil producer; the other 13 were dry holes. Included among the dry holes were the first two wells put down off Colombia's Pacific coast. Of the 24 development wells drilled during 1967, 12 were completed as crude oil producers, one was a gas producer, and 11 were dry holes. Drilling was concentrated in the Orito oilfield, and some development activity probably also occurred in

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Table 4.—Colombia: Salient statistics of the petroleum and natural gas industry

		1965	1966	1967
Crude oil:				
Production	thousand 42-gallon barrels	72,670	71,430	68,877
Delivered to refineries	do	30,715	35,232	39,043
Exported	do	40,682	35,575	29,876
Natural gas:				
Production	million cubic feet	93,823	98,096	99,920
Consumption	do	28,906	33,472	NA
Injected [1]	do	28,444	36,684	42,097
Flared [2]	do	36,473	27,940	NA
Natural gas liquids:				
Production	thousand 42-gallon barrels	1,636	2,079	2,914
Consumption [3]	do	618	837	1,614
Delivered to refineries	do	589	815	897
Exported, mixed with crude oil	do	263	214	224
Refinery products:				
Refinery output [4]	do	34,842	37,381	42,217
Consumption [5]	do	24,988	27,291	28,530
Exported	do	5,220	6,295	8,524

NA Not available.
[1] Includes small quantities used for gas-lift operations.
[2] Includes shrinkage at natural gas plants.
[3] Excludes propane and butane output of refineries.
[4] Includes quantities used for refinery fuel.
[5] Excludes most oil company use.

Source: Centro de Información de la Industria Petrolera.

Table 5.—Colombia: Crude oil production by companies

(Thousand 42-gallon barrels)

Company	Principal ownership or affiliation	1965	1966	1967
Antex Oil and Gas Co., Inc.	U.S. citizens	20	7	1
Compañía Petrolera de Nueva Granada.	United Fruit Co	37	18	15
Colombia-Cities Service Petroleum Corp. (COLCITCO).	Cities Service Co	6,610	6,014	5,425
Colombian Petroleum Co. (COLPET)	Socony Mobil Oil Co. and Texaco Inc.	10,425	9,510	8,389
Empresa Colombiana de Petróleos (ECOPETROL).	Colombian Government	10,354	9,933	10,667
International Petroleum (Colombia), Ltd. (INTERCOL).	Standard Oil Co. (New Jersey)	273	388	365
Sinclair and BP Colombian, Inc.	Sinclair Oil Corp. and British Petroleum Co., Ltd.	11,630	10,981	10,061
Shell-Condor, S.A.	Royal Dutch/Shell Group	10,840	10,364	9,541
Richmond Petroleum Co. of Colombia.	Standard Oil Co. of California	11,275	12,704	12,539
Texas Petroleum Co. (TEXPET)	Texaco Inc.	11,206	11,511	11,874
Total		72,670	71,430	68,877

Source: Centro de Información de la Industria Petrolera.

the nearby Caiman, Puerto Colon, and Temblon fields. All four of these Putumayo area fields, held jointly by Texas Petroleum Co. (TEXPET), which served as operator, and Colombian Gulf Oil Co., were shut in at yearend awaiting the completion of pipeline facilities.

A program to increase the capacity of water injection facilities at the La Cira-Infantes field of Empresa Colombiana de Petróleos (ECOPETROL) was initiated during 1967. The water treatment and pumping system for secondary recovery at this field was to be expanded from its existing injection capacity of 75,000 barrels of water per day to 175,000 barrels daily by mid-1968 and 300,000 barrels per day at yearend 1969. Another water injection project undergoing expansion in 1967 was that in the Tibu field. There, Colombian Petroleum Co. (COLPET) was in the process of increasing the capacity of its 100,000-barrel-per-day waterflood system by 10,000 barrels daily.

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Total distillation capacity of the country's refineries was increased to 124,800 barrels per day upon completion of the expansion program at ECOPETROL's Barrancabermeja plant during the latter part of 1967. The enlargement of this refinery raised its rated daily capacity from 45,000 to 71,600 barrels. In addition to the expansion of distillation facilities at Barrancabermeja, a 30,000-barrel-per-day vacuum unit, a 17,300-barrel-per-day catalyitc cracker, a vapor recovery unit, and a 30-ton-per-day sulfur unit were added. A 40,000-ton-per-year paraffin unit under construction at yearend was scheduled for completion during 1968. Also under construction adjacent to the Barrancabermeja refinery was a low-density polyethylene plant with a planned capacity of 15,000 tons per year. This joint venture between ECOPETROL and The Dow Chemical Co. was scheduled for completion during late 1968 or early 1969.

The most important pipeline project in progress during 1967 was a crude oil line from the Orito field to the Pacific coast port of Tumaco. This line was being built at an estimated cost of $50 million for TEXPET and Colombian Gulf by the Hannibal Construction Co. of Tulsa, an affiliate of Williams Brothers. TEXPET will be the operator of the line after its completion during late 1968 or early 1969. The line will have a total length of 309 kilometers and will cross the Andes Mountains at an elevation of 11,500 feet. A combination of 18-, 14-, and 10-inch pipe will be used in order to compensate for pressure gradients as closely as possible. Four pump stations will be used to push the oil up the eastern slope of the mountains, and five pressure-relief stations will be used on the steep western downslope. The combined horsepower of the four pump stations will give the pipeline an initial capacity of 100,000 barrels per day but this could be increased to 150,000 barrels per day by the installation of additional pumping facilities and the construction of several loop lines. Although the line will initially serve only the Orito field, plans were to eventually connect it with other Putumayo area discoveries.

Preliminary work on the sea loading facilities at the Pacific terminus of the Orito-Tumaco pipeline probably began late in 1967. The construction firm retained to complete these facilities for TEXPET and Colombian Gulf was Brown and Root, Inc., of Dallas, Tex. Since the harbor at Tumaco is shallow, a floating berth will be anchored in 90 feet of water at a point 7.2 kilometers offshore. This berth will be connected to the tank farm at Tumaco by a 36-inch pipeline buried under the ocean bed.

A refined products pipeline from Puerto Salgar to Cantago, being constructed for ECOPETROL, was scheduled for completion by April 1968. This line will link ECOPETROL's Galán-Puerto Salgar products pipeline with the Buenaventura-Cartago line of Oleoducto del Pacífica, S.A. Upon completion of the Puerto Salgar-Cartago link, ECOPETROL will be able to distribute refined products via pipeline from its Barrancabermeja refinery all the way to Beunaventura. This will cause some change in the distribution system for western Colombia where INTERCOL has been supplying products by means of tanker shipments from its Mamonal refinery to Buenaventura.

A new ocean terminal was inaugurated at Mamonal by ECOPETROL in 1967. This terminal has a combined crude oil and refined products tanker loading capacity of 72,000 barrels daily. Four tanks at the terminal can store a total of 528,000 barrels of crude oil and products.

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The Mineral Industry of the Democratic Republic of the Congo (Kinshasa)

By Walter C. Woodmansee [1]

On January 1, 1967, the Congolese Government assumed control of all assets of Union Minière du Haut-Katanga in the Congo; these were valued at $800 million. A new Congolese company, Société Générale Congolaise des Minerais (GECOMIN), was organized as controller of the former Union Minière properties. The company is administered by a nine-man council and has Belgian personnel in key positions of Director General and Deputy Director General. A three-man commission was to be organized, comprised of one representative of GECOMIN, one of Belgian interests, and a third chosen by agreement of the two parties, to arbitrate compensation to Union Minière for the nationalization of its Properties in the Congo.

Negotiations were started between Belgian private, Belgian Government, and Congolese Government representatives in order to reach an agreement on managing the properties and resuming mineral shipments. On February 15, a technical cooperative agreement was concluded whereby Société Générale des Minerais (SGM) would act as manager for GECOMIN, in matters involving the mining, processing, and marketing operations. Final approval of programs was to be by the Board of Directors of GECOMIN. This agreement was for 3-years' duration, with 2-years' notice given before termination. After loading of the copper and other mineral products at African ports, SGM also would pay GECOMIN 70 percent of the f.o.b. value of these products, the remainder would be paid at the time of the final sale by SGM. SGM was to receive 4.5 percent of GECOMIN gross revenues as fee for its managerial services. The complete text of the terms of the GECOMIN–SGM agreement were published in Agence Congolaise de Presse on February 21.

GECOMIN planned to offer 40 percent of its ownership to various international interests, but at yearend no agreement had been reached. Roan Selection Trust Ltd., the Peñarroya group, and the Banque Lambert, Brussels, were approached regarding an international consortium to participate in GECOMIN. Late in the year, Maurice Tempelsman, the U.S. mining industrialist with extensive interests in Africa, reportedly was offered the 40-percent participation.[2]

Although metal and mineral shipments from GECOMIN properties in Katanga were interrupted during the GECOMIN-Belgian negotiations of January and February, shipments were near or above normal for the remainder of the year, and new production highs for metallic copper and zinc concentrate were reached. GECOMIN placed large orders for new equipment, mainly from the United States, in preparation for increased production.

Activities in other mineral sectors of the country remained fairly normal. The mineral industry continued as a major source of revenue and foreign exchange. In 1967 Government revenue from GECOMIN op-

[1] Physical scientist, Division of International Activities.

[2] Metals Week. V. 39, No. 2, Jan. 8, 1968, p. 5.

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erations was 323.9 million,[3] 95.5 percent of which was from copper. The Gross National Product (at current prices) in 1966 was estimated at $1,800 million, based on Banque Nationale calculations. The mineral industry contributed about 40 percent of the national budget and employed about 50,000 Africans.[4] At the beginning of the year, the GECOMIN staff included 1,661 expatriates and 249 Africans; at yearend, the expatriate staff had dropped to 1,096 and the African staff had increased to 368. Recruitment efforts were active throughout the year. At yearend, GECOMIN employed 21,752 African laborers.

The Congolese Government continued efforts to restrict the influence of foreign-owned and foreign-operated companies. In 1966 the Government voided all mineral property rights issued before independence on June 30, 1960, required all concession holders to reapply for concessions, placed a 10-percent levy on all mineral production, and required all foreign companies with operations in the country to establish headquarters in Kinshasa. After the GECOMIN-Belgian controversy in early 1967, however, Government moves against foreign business and personnel were slackened. Foreign management groups were given authority to reorganize certain firms for greater efficiency.

A new mining code, prepared by the Ministry of Mines, was adopted in April. It called for increased Congolese participation in and Congolese control of mining ventures. Foreign investors had three possibilities in establishing companies in the Congo: 1) With Congolese private interests, 2) with the Congolese Government, and 3) with foreign financing entirely (but with company headquarters in the Congo).[5]

Progress was made on the Inga Dam hydroelectric project on the Congo River, 120 kilometers upriver from the Atlantic Ocean. In October a $20 million loan was negotiated with Italian interests to provide equipment for first-phase construction, which was expected to be completed in 1972 or 1973.

The National Institute of Mines was moved to Lubumbashi from Bukavu, which was evacuated following the mercenary uprising during the summer. According to the Institute's director, the school had an enrollment of about 100 students. The majority of the first graduating class of six mining engineers and six geologists was expected to assume duties with GECOMIN. The Institute's staff of approximately 20 professors was furnished by French and Belgian technicial assistance, the United Nations, and the Congolese Government.

PRODUCTION

Although the Congolese Government took major steps toward assuming controlling interests in all sectors of the mineral industry, disruptions in mining were few, and there was little change in mineral production trends. Output of copper and zinc concentrate attained record highs, although increases were modest. Diamond and manganese ore output also showed slight increases. Output of several commodities, including cadminum, cobalt, germanium, gold, and tin, was reduced.

A new petroleum refinery was dedicated late in the year, and production is expected in 1968.

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[3] On June 24, 1967, a monetary reform program was instituted, under the auspices of the International Monetary Fund, to stabilize the economy and curb strong inflation. The Congolese Franc (CF) was devaluated from the rate of US$1=150 CF to US$1=500 CF, as of that date. A new monetary unit, the zaire, is equal to US$2 or 1,000 CF.

[4] Industries et Travaux d'Outremer. No. 167, October 1967, p. 915.

[5] World Mining. V. 3, No. 8, July 1967, p. 40.

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Table 1.—Congo (Kinshasa): Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Beryl	213	123	19	---	2
Cadmium r	393	469	399	421	263
Cobalt	7,376	7,676	8,388	11,297	[1] 9,718
Columbium-tantalum concentrate	e 74	e 46	93	r 96	146
Copper, blister and refined	271,337	276,640	288,605	315,664	318,976
Germanium, content of concentrate kilograms	7,283	8,271	14,638	14,970	347
Gold troy ounces	214,574	188,693	90,408	r 159,821	152,973
Lead	1,185	1,045	1,551	1,060	e 1,000
Manganese ore	270,033	309,700	377,575	249,303	271,636
Monazite	---	---	20	NA	NA
Platinum and palladium troy ounces	7	1	---	---	---
Silver do	1,097,176	1,480,252	1,538,413	r 1,851,402	1,839,763
Tin:					
Cassiterite, metal content long tons	6,883	5,108	6,324	5,036	4,664
Smelter do	1,441	1,485	1,815	2,002	1,815
Tungsten concentrate, 60 percent WO3 basis	202	234	215	189	112
Zinc:					
Concentrate, metal content	103,545	105,540	119,154	r 113,437	[2] 121,547
Refined, electrolytic	52,724	55,553	57,019	e 61,500	61,492
Nonmetals:					
Cement thousand tons	246	225	248	285	e 260
Diamond:					
Gem thousand carats	296	295	14	12	1
Industrial do	14,468	14,457	12,490	r 12,418	13,154
Lime	66,703	67,722	65,228	63,005	NA
Salt	343	525	125	80	NA
Sulfuric acid thousand tons	NA	NA	NA	124	e 120
Mineral fuels: [3] Coal, bituminous do	r 103	r 106	r 116	110	133

e Estimate. r Revised. NA Not available.

[1] Includes 6,465 tons in cathodes and 3,253 tons in granules.

[2] From 214,710 tons of concentrate at 56.61 percent zinc produced at Kipushi.

[3] The petroleum refinery near Moanda was inaugurated in November 1967, but output data were not available.

TRADE

The mineral industry continued as the dominant source of foreign exchange in the country in 1966, the latest year for which data were available. Because of a substantial increase in prices, copper earnings were $95.5 million higher than in 1965, and represented about 57 percent of total export earnings for the year. Major mineral export values were as follows:

	Value (million dollars)	
	1965	1966
Copper	171.4	266.9
Cobalt	18.2	29.7
Tin and cassiterite	18.3	26.4
Diamond	23.3	25.6
Zinc and concentrate	21.5	21.1
Total	252.7	369.7

Complete data on destinations were not available, but copper went mainly to Belgium, Italy, France, and the Republic of South Africa. Metallic tin, cassiterite, and zinc concentrate were shipped mainly to Belgium. The United Kingdom received all diamond legally exported from the Congo. Routes to port were the Voie Nationale and rail to Lobito, Beira, and Dar-es-Salaam.

Major mineral commodity imports in 1966 were petroleum refinery products, $19 million ($15.9 million in 1965), and iron and steel semimanufactures, $14.4 million ($10.6 million in 1965).

The important role of the mineral industry in the Congolese foreign trade balance is indicated in the following tabula-

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tion showing the relationship between mineral and total trade:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	261.2	326.0	80.1
1966	379.6	467.3	81.2
Imports:			
1965	47.2	319.9	14.8
1966	54.2	336.5	16.1
Trade balance:			
1965	+214.0	+6.1	XX
1966	+325.4	+130.8	XX

XX Not applicable.
[1] Includes only those commodities listed in table 2 of this chapter.

According to U.S. Department of Commerce statistics, the United States imported metals and minerals from the Congo during 1965 and 1966, as follows:

Commodity	Value (thousand dollars)	
	1965	1966
Cobalt	9,737	14,873
Diamond, industrial	913	4,491
Manganese ore	9,648	6,763
Zinc, unwrought	3,305	3,357
Other ores and concentrates	807	2,147
Total	24,410	31,631

Table 2.—Congo (Kinshasa): Foreign trade in selected mineral commodities [1]

(Metric tons unless otherwise specified)

		1965	1966
Exports:			
Metals:			
Cadmium		390	351
Cobalt		8,380	11,062
Columbium-tantalum concentrate		62	56
Copper:			
Blister		63,323	79,475
Unwrought, refined, mainly wire bars		142,319	156,364
Unwrought, refined, cathode		72,581	74,785
Total		278,223	310,624
Gold	troy ounces	40,285	58,418
Manganese ore		311,188	234,137
Tin:			
Cassiterite	long tons	5,062	7,109
Smelter	do	r 1,259	1,873
Tungsten concentrate		208	284
Zinc:			
Concentrate		89,650	94,897
Refined, electrolytic		51,931	50,970
Nonmetals:			
Cement		30,530	22,725
Diamond	thousand carats	12,583	12,480
Imports:			
Metals:			
Aluminum, all forms		-------	1,772
Copper, semimanufactures		224	170
Iron and steel, semimanufactures		42,806	66,238
Ores, scrap, waste, n.e.s		253	286
Nonferrous metals, n.e.s		843	355
Nonmetals:			
Cement		7,963	526
Construction materials, undifferentiated		30,830	42,886
Fertilizer materials, natural and manufactured		5,551	6,030
Salt		22,723	50,408
Minerals, nonmetallic, n.e.s		12,690	13,381
Mineral fuels:			
Coal and briquets		336,684	231,609
Petroleum refinery products:			
Gasoline, motor	thousand 42-gallon barrels	1,159	1,126
Gasoline, aviation	do	564	585
Kerosine	do	450	581
Fuel oils, undifferentiated	do	1,135	1,376
Lubricating oils	do	96	143
Total	do	3,404	3,811
Mineral tar and crude chemicals from coal, oil, and gas distillation		2,844	4,018

[1] Data by country are not available.

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Table 3.—Congo (Kinshasa): Copper exports in 1967, by port
(Metric tons)

Form of copper	Shipping port				Total
	Matadi, Congo (Kinshasa) (via Voie Nationale)	Beira, Mozambique	Dar-es-Salaam, Tanzania	Lobito, Angola	
Electrolytic ingots	113,853	6,812	17,765	23,468	161,898
Cathodes	32,930	1,606	-------	47,351	81,887
Blister and other	27,848	26,848	25,866	-------	80,562
Total	174,631	35,266	43,631	70,819	324,347

COMMODITY REVIEW

METALS

Columbium-Tantalum.—Final agreement between Union Carbide Corp. and the Congolese Government on participation in exploitation of the Lueshe deposit, Kivu province, was pending at yearend. Société Minière de Lueshe (SOMALU) was constituted in 1960 by Union Carbide and the Government. Exploration continued in 1967. Reserves were 34.5 million tons proved ore, containing 15.4 kilograms of pyrochlore per ton, and 119.5 million tons probable, containing 9.7 kilograms of pyrochlore per ton. Also, 500,000 cubic meters of associated alluvium contains 1.55 kilograms of pyrochlore per ton.

At Bingo, also in Kivu province, the ore is reportedly richer and less complex. Ore reserves are 2.3 million tons proved at 3.6 percent Cb_2O_5 to depths of 25 meters, and 4.8 million tons probable at 2.3 percent Cb_2O_5. Preconcentration to a grade of 40 to 45 percent Cb_2O_5 was considered feasible.[6]

Copper.—Despite the GECOMIN–SGM controversy early in the year, copper output reached a new high, and exports exceeded those of 1966 by more than 3,000 tons. Average copper content of ores from GECOMIN properties was 4.8 percent. Total concentrate production was 1,338,346 tons. GECOMIN planned an output rate of 320,000 tons of copper during 1968 and undertook long-range studies for expansion in subsequent years.

Production under Union Minière du Haut-Katanga in 1966[7] and GECOMIN in 1967[8] was as follows:

Form of copper produced	Metric tons	
	1966	1967
Ingots, electrolytic	156,350	160,822
Cathodes	79,729	81,448
Blister and other	79,585	76,706
Total	315,664	318,976

An exploration and mining agreement was reportedly signed on December 18, 1967, between the Nippon Mining Co., Ltd., Japan, and the Congolese Government. The area to be explored comprised 36,000 square kilometers between Musoshi, Southern Katanga Province, and the Zambian border. Near Musoshi, a vein 6 to 8 meters thick reportedly contains 3.5 percent copper. The agreement involved a 3-year exploration period, a joint operating company, and a 5-year investment plan of $40 million. An annual production rate of 42,000 tons of concentrate, containing 36 to 37 percent copper, was planned for 1970. The Japanese will ship the concentrate to Japan via the port of Beira, Mozambique. A large staff of Japanese engineers, geologists, and other technical personnel was in the Congo.

Manganese.—Output from the Société Minière de Kisenge (SMK) mine at Kisenge in southwest Katanga Province, was greater in 1967 than in 1966, although the mine was closed down in November after an invasion of mercenary troops. After cessation of mining, stockpile ore was shipped at a reduced scale by personnel who were flown in daily from Lubumbashi. The average grade of ore was 51 percent manganese. Prior to the invasion, SMK employed approximately 50 European technicians.

In order to maintain SMK operations, the Congolese Government agreed to a reduction of export taxes, a long-term, low-interest loan to SMK, and a waiver

[6] United Nations, Economic Commission for Africa. The Rare Minerals of the Democratic Republic of the Congo. ECA Seminar on New Metals and Minerals, Addis Ababa, Ethiopia, February 1968, pp. 7–10.
[7] Union Minière du Haut-Katanga, Rapport Annuel. 1966, p. 18.
[8] U.S. Embassy, Kinshasa. Mineral Industry Report for Katanga. State Department Airgram A–88, May 16, 1968, 12 pp.

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of import duties on replacement equipment.

Tin.—The Congolese Government canceled 50 concessions in January, when owners failed to apply for renewal in accordance with new mining laws. For those concessions renewed, the Government intended to obtain shares in operating companies.[9]

Operations of Compagnie Géologique et Minière des Ingénieurs et Industriels Belges (GEOMINES) were normal in 1967, despite a slight reduction in technical personnel after the political unrest in the area during the summer. Cassiterite production was 2,543 long tons, compared with 2,818 long tons in 1966. Smelter tin production continued at a rate of about 2,000 long tons per year.

In March GEOMINES operations in the Congo came under the control of a new company, Société Géologique et Minière du Congo (GEMICO), with 50 percent Congolese participation. GEOMINES personnel were to retain responsibility for technical operations and marketing. However, at yearend an accord had not been signed, and GEOMINES remained the sole major company directed entirely from Brussels. The company employed 50 European technicians and 3,500 Congolese during the year.

NONMETALS

Diamond.—In June the Ministry of Land, Mines, and Energy announced in Kinshasa that Société Minière de Bakwanga (MIBA) would sell diamonds directly to the de Beers Consolidated Mines, Ltd. organization rather than through SGM, as formerly. Britmond Co. (British Diamond Distributors Ltd.) of Hamilton, Bermuda, a de Beers affiliate, was given a monopoly on diamond purchasing in the Congo and opened a purchasing office in Kinshasa.

MIBA established headquarters at Mbuji-Mayi and was granted a charter under Congolese laws. In 1966 the company moved about 5 million cubic meters of overburden and gravel.[10] A new sorting plant employed about 220 Europeans and 3,600 Africans. "Congolization" of operations continued, with training schools in the Congo and engineering study provided in Belgium.

Société Internationale Forestière du Congo (FORMINIERE) was taken over by the Government in 1966. The company sought compensation.

Illegal mining and smuggling continued on a large scale, estimate at nearly half the official reported production rate. Congo (Brazzaville) reported exports of 5.3 million carats in 1965 [11] of diamond that probably originated largely in Congo (Kinshasa).

MINERAL FUELS

Coal.—Société des Charbonnages de la Luena, an affiliate of GECOMIN, increased output of its Kaluku mine. Sales in 1966 were 37,947 tons to Union Minière du Haut-Katanga, 34,823 tons to Cimenkat, the cement producer, and 33,805 tons to the Bas Congo au Katanga Railroad Company.[12] The company acquired two new Bucyrus drag lines. The coal is of inferior quality, and future operations are indefinite.

Petroleum.—The 12,500-barrel-per-day refinery of Société Congolaise Italienne de Raffinage (SOCIR), near Moanda at the mouth of the Congo River, was dedicated in November. The company is owned by the Congolese Government (51 percent) and Ente Nazionale Idrocarburi (ENI) (49 percent). In December Esso received the first crude oil tender for 200,000 tons (about 1.5 million barrels) of Abu Dhabi crude, for delivery from January to April, 1968.[13]

Arrangements for pricing and marketing of refinery products were under negotiation between the Government, ENI, and four distributors in the Congo—Petrofina S.A. (Belgium), Shell Oil Company (Netherlands), Mobil Oil Corp. (United States), and Texaco Inc. (United States).

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[9] Tin International. V. 60, January 1967, p. 11.
[10] Mining Journal. V. 269, No. 6885, Aug. 4, 1967, p. 77.
[11] International Financial News Survey. V. 19, No. 37, Sept. 22, 1967, p. 301.
[12] Industries et Travaux d'Outremer. No. 164, July 1967, p. 76.
[13] Petroleum Intelligence Weekly. Feb. 2, 1968, p. 7.

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The Mineral Industry of Cyprus

By John A. Stock [1]

The mineral resources of Cyprus are an important factor in the country's economy inasmuch as mineral exports represent about 44 percent of the value of total domestic exports and they continue to be a principal source of foreign exchange. Mining contributed about 6 percent to the estimated 1967 gross national product (GNP) of $402 million.[2]

Of the major mineral products of Cyprus, the greatest income was provided by the metallics which included copper ores and beneficiation products, iron pyrites, and chromite. The important nonmetallics are asbestos, cement, and gypsum. Of these, cement and asbestos showed significant increases in 1967. The bulk of the important minerals are sold to the European markets, although most of the crude gypsum is exported to Far Eastern markets. Some asbestos, cement, and calcined gypsum are sold domestically.

Three companies produce virtually all the copper and pyrites in Cyprus. The largest, Cyprus Mines Corp., is U.S. owned and produces 60 to 70 percent of the output. The Hellenic Mining Co., Ltd., is the main source of chromite as well as copper products and iron pyrites. The Cyprus Sulphur and Copper Co., Ltd., produces copper concentrate and iron pyrites.

About 5,000 persons or about 2 percent of the total labor force were employed in mining or quarrying operations during 1966. This was a decline from previous years and resulted from greater mechanization in the mines and the elimination of marginal operations over the past few years when world mineral prices were depressed.

Parliament ratified a measure to create an oil refinery in 1965 after 2½ years of investigation, however, difficulties still persist and construction had not begun as of the end of 1967. The refinery is planned to be a joint venture of the Cyprus Government and a private group, composed of Mobil, Shell, and British Petroleum oil companies, on a 50–50 basis of participation.

PRODUCTION

The estimated value of Cyprus' mineral production for 1967 remained, as in recent years, at approximately $30 million. Output of copper contained in mineral materials was about 20 percent less than in 1966, as the result of declining grade in ore. The expectation that the decline in volume would be offset by increased world prices did not materialize. However increased European demands for iron pyrites as a source of sulfur and the consequent increase in price was believed to have balanced the losses in copper mineral production. Recent investments in plant, increased exports, and somewhat greater consumption for sheeting and other asbestos cement goods indicated a greater production of asbestos in 1967. Cement production in 1967 was at an alltime high at about twice the 1966 tonnage.

In 1966 the value of copper products was 58 percent of the total mineral production, pyrite 23 percent, asbestos 9 percent, cement 7 percent, gypsum 1 percent, and all others 2 percent.

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[1] Mining engineer, Division of International Activities.

[2] Where necessary, values have been converted from Cyprus pounds (C£) to U.S. dollars at the rate of C£.357143=US$1.00.

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Table 1.—Cyprus: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 e
Metals:					
Chromite	4,909	3,000	4,990	10,464	10,500
Copper [1]	26,000	13,000	20,450	r 17,757	14,200
Nonmetals:					
Asbestos	18,109	12,478	15,986	22,180	24,000
Cement	96,000	70,000	98,357	r 98,560	192,000
Gypsum:					
Crude	100,000	45,000	60,975	45,061	45,000
Calcined	52,000	30,000	20,325	20,540	20,500
Lime	59,341	e 40,000	73,550	NA	NA
Mineral pigments:					
Terre verte	10	10	10	NA	12
Umber	6,000	e 6,000	14,532	5,590	5,600
Yellow ocher	500	e 400	304	102	100
Pyrites (sulfur content)—thousand tons	449	329	483	r 386	480
Salt	7,000	NA	5,355	4,013	4,000

e Estimate. r Revised. NA Not available.

[1] Estimated content of concentrates, cement copper, and cupreous pyrite; excludes content in iron pyrites ore which may or may not be recovered.

TRADE

Mineral exports have increased over previous years and represent a large portion of total trade as follows:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports	34.2	77	44
Imports	21.4	158	14
Trade balance	12.8	−81	XX

XX Not applicable.

Copper is by far the most valuable single mineral export item. In view of the estimated date of depletion of Cyprus' copper resources, the heavy dependence on mineral exports for foreign exchange is especially significant.

About 75 percent, or $26 million, of total mineral exports came from the sale of metallics whereas nonmetallics yielded only $8 million. Pyrites accounted for about $6 million of the nonmetal total. Although barter arrangements with Czechoslovakia and Bulgaria were made in 1965 for chromite from Cyprus, none was exported to these countries in 1966.

The value of all classes of mineral imports increased with mineral fuels at $10.1 million, metals at $7.6 million, and nonmetals at $3.7 million.

In accordance with an agreement with the U.S.S.R. signed in February 1965 for the exchange of goods worth more than $9.8 million over a 3-year period, Cyprus imported about 23,000 metric tons of cement, 979,000 barrels of fuel oil, and a small tonnage of pig iron from that country in 1966. However, despite the understanding that, under the agreement, the U.S.S.R. would also become the main supplier of the iron and steel needs of Cyprus, less than 25 percent of the total pig iron and about 1 percent of the steel imports originated in the U.S.S.R. during 1966. Cyprus' main source of pig iron was its historical supplier, the United Kingdom, while most of its steel was imported from western Europe. The bulk of the remaining imports of mineral commodities originated from various member countries of the European Economic Community and the United Kingdom.

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Table 2.—Cyprus: Exports of mineral commodities

(Metric tons)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Chromite	2	2,541	All to Canada.
Copper:			
Concentrate	70,767	58,682	West Germany 41,511; Spain 17,171.
Cement	4,994	14,778	West Germany 6,423; Spain 5,718.
Cupreous pyrite	176,298	164,248	Netherlands 84,640; West Germany 79,608.
Nonmetals:			
Asbestos, crude	17,540	19,191	United Kingdom 5,498; Denmark 4,833; Thailand 3,046.
Gypsum:			
Crude	41,701	56,543	Taiwan 31,129; Ceylon 15,911.
Calcined	1,441	1,215	Lebanon 1,026; Sudan 40.
Mineral pigments:			
Ocher	410	319	United States 186; United Kingdom 72.
Terre verte	11	12	NA.
Umber:			
Crude	729	747	United States 499; United Kingdom 191.
Burnt	5,408	4,684	United States 2,971; United Kingsom 1,142.
Pyrite	712,416	746,819	Italy 266,274; United Kingdom 135,002; Belgium 118,392; Netherlands 117,898.
Others	3,976	4,182	Israel 3,379; Libya 729.

Source: Statistics of imports and exports 1966; Department of Statistics and Research, Ministry of Finance, Nicosia, July 1967.

Table 3.—Cyprus: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys	288	406	Greece 115; United Kingdom 93.
Copper, including brass	26	89	Switzerland 71; United Kingdom 13.
Gold, troy ounces	13,036	15,706	United Kingdom 15,644.
Iron and steel:			
Pig iron	60	259	United Kingdom 198; U.S.S.R. 61.
Ferroalloys	15	5	All from West Germany.
Semimanufactures	43,447	50,369	France 14,201; Belgium 7,307; West Germany 3,413; Luxembourg 2,638.
Lead and alloys	64	281	United Kingdom 241; Lebanon 27.
Tin and alloys, long tons	r 569	607	United Kingdom 578; Greece 28.
Zinc and alloys	61	64	Belgium 47; United Kingdom 15.
Nonmetals:			
Asbestos	4,146	2,165	Yugoslavia 1,462; Bulgaria 157.
Cement	57,044	87,675	Israel 29,367; Greece 26,457; U.S.S.R. 23,063.
Clays	237	162	United Kingdom 110; Italy 51.
Fertilizer materials, manufactured:			
Nitrogenous	31,246	16,112	Italy 8,526; Portugal 3,226.
Phosphatic	37,329	26,160	Yugoslavia 19,510; Lebanon 1,951.
Potassic	20,155	376	All from France.
Pumice	453	551	All from Greece.
Salt	249	320	United Kingdom 290.
Stone, building:			
Unworked, value	$10,966	$24,248	Italy 14,246; Belgium 4,466; Greece 2,968.
Worked, do	$5,859	$9,456	Italy 9,293.
Sulfur	1,863	2,023	Greece 1,280; France 492; Portugal 207.
Mineral fuels:			
Asphalt and bitumen, natural	10,770	12,460	Spain 5,752; United Arab Republic (Egypt) 5,412.
Coal	204	522	All from West Germany.
Coke	458	350	Do.
Petroleum refinery products:			
Motor gasoline, thousand 42-gallon barrels	556	607	Italy 235; Netherlands Antilles 111.
Aviation gasoline, do	56	20	Iran 7; Netherlands Antilles 7.
Kerosine, do	196	239	Italy 98; France 37.
Jet fuel, do	57	28	Aden 24; Italy 4.
White spirits and solvents, do	3	3	Netherlands Antilles 2; United Kingdom 1.
Gas oil, do	642	642	Italy 275; Netherlands Antilles 95.
Fuel oil including deisel, do	1,114	1,298	U.S.S.R. 979; Italy 167; France 84.
Lubricating oil and grease, do	r 33	32	United Kingdom 23; Netherlands 4.
Other, including pitch and wax, do	r 4	3	United Kingdom 2.

r Revised.

Source: Statistics of imports and exports for 1966; Department of Statistics and Research, Ministry of Financei Nicosia, July 1967.

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COMMODITY REVIEW

METALS

Chromite.—Exports of chromite in 1966 showed improvement over the very small tonnage in 1965, but was still only about 27 percent of the amount exported in 1964. All of the 1966 tonnage was exported to Canada in spite of the specific mention of chromite as one of the commodities to be included in the barter agreement with Czechoslovakia and Bulgaria.

Because of competition with other relatively nearby countries such as Turkey, Cyprus is not in a good position to export quantities of chromite unless world price and demand are relatively high. Prices during most of 1967 were stable, but during the last quarter of the year indications were that because of sanctions against Rhodesian chromite, world prices would increase. Exports of Cypriot chromite therefore may well increase in 1968, but will remain sensitive to prices and availability on the world market.

Copper.—Mining of copper ore continued in 1967 by CMC, Hellenic Mining Co. Ltd., and the Cyprus Sulphur and Copper Co. Ltd.

All three companies beneficiate portions of their ore to produce copper concentrate and iron pyrites. CMC also recovers cement copper by a leaching and precipitating process. Although European copper prices in 1966 were high, relative to prior years, the average price softened somewhat during 1967.

Ore was produced from the Mavrovouni and Skouriotissa mines of CMC and stripping of overburden was begun on the Apliki and Lefka "A" mines during the year. There was no activity at the Mathiati mine.

In January 1966, geological exploration and diamond drilling by the Cyprus Mines Corp. had proven reserves of 5.3 million tons of 1.5 percent copper ore and possible reserves of 8 million tons, sufficient to assure mining at the current rate through 1982.

As a byproduct of copper operations, CMC has been Europe's largest supplier of high-grade nonarsenical flotation pyrites and with the prospect of increased demand for sulfur in Europe may proceed with a new technique of pyrite pellet production perfected by the Battelle Memorial Institute of the United States and Lurgi G.m.b.H. of West Germany.

The Hellenic Mining Co. Ltd. now owned by the Greek Cypriot Community has been operated at a loss, but recent high prices for copper and pyrites should have resulted in profits. Production originated in 1966 from the Kalavassos, Kokkinopezoula, Memi, and Mathiatis mines. Exploratory drilling totaling 67 holes was carried on at various prospects during 1966. Results were not reported.

The Cyprus Sulphur and Copper Co. Ltd. produced and milled ore averaging 1.12 percent copper and 15.2 percent sulfur from Limni and Evloimeni mines.

NONMETALS

Asbestos.—The Cyprus Asbestos Mines, Ltd., quarried 2.5 million tons of rock in 1966 and milled half this output to produce almost equal tonnages of long- and short-fiber asbestos. A small production increase in 1967 over 1966 is estimated. Most of this production is exported and a small amount is used in the manufacture of flat and corrugated asbestos sheeting and molded goods.

Cement.—The 1967 output of cement was approximately 100 percent greater than in any previous year. Inasmuch as the island's sole producer has been the Cyprus Cement Co. Ltd., equipped with a single kiln rated at 90,000 metric tons annually, it is highly probable that another plant is now contributing to the total cement production. Capital expenditures by the Cyprus Cement Co. Ltd during 1965–66 totaled about $183,000 and appeared insufficient to double present plant capacity, but instead suggested plant expansion or modernization. Secondly, the Cyprus Ministry of Commerce and Industry announced the establishment of various new plants including a cement plant in 1966. Presumably this is part of an effort to restructure the economy threatened by a loss of income resulting from the withdrawal of foreign military personnel and the decline of copper production.

Gypsum.—Production of gypsum by the United Gypsum, Ltd., in 1967 is believed to have been maintained at the 1966 level.

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The Mineral Industry of Czechoslovakia

By Bernadette Michalski [1]

Czechoslovakia continued to produce sizable quantities of coking coal and nonmetallic minerals such as gypsum, kaolin, limestone, and magnesite in 1967. The country's fuel and refractory mineral resources supported significant metallurgical and fabricating industries. Although most of the nation's iron ore requirements are met by imports, Czechoslovakia ranked 10th among world steel producers in 1967.

PRODUCTION

Although 1967 production data for most nonmetallic minerals was not reported, the overall growth rate of this industry in 1967 was reported at 10 percent, surpassing the overall industrial growth rate of 7.1 percent. Economic reforms directed toward profit motivation, closed a number of marginal coal and iron mines, resulting in lower levels of production for these commodities than in 1966. In the industrial sectors these reforms resulted in a 6 percent increase in industrial labor productivity and a slowdown of the industrial employment growth rate of 1.1 percent.

TRADE

While Czechoslovakia has maintained a favorable overall trade balance, the nation's imports of iron ore, nonferrous metals, crude petroleum, and bituminous coal have made Czechoslovakia a net importer of mineral commodities as indicated in the following tabulation:

	Value (million koruna)[1]		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1964	3,868	18,545	21
1965	3,937	19,357	20
1966	3,739	19,764	19
Imports:			
1964	4,833	17,489	28
1965	5,297	19,242	28
1966	4,723	19,699	24
Trade balance:			
1964	−965	+1,056	XX
1965	−1,360	+115	XX
1966	−984	+65	XX

XX Not applicable.
[1] Official exchange rate, 1 koruna=US$0.14.

Published material on the foreign trade of Czechoslovakia are evidently incomplete. Soviet statistics indicate the export of certain commodities to Czechoslovakia that are not recorded in Czechoslovakian import publications. Moreover, Soviet statistics report import of ores and metals from Czechoslovakia valued at $106 (96 million rubles) which do not appear in Czechoslovakian export data. Presumably these imports included antimony, uranium, tin, and mercury. The importance of the U.S.S.R. as a trading partner, is readily apparent from the trade tables.

[1] Commodity research specialist, Division of International Activities.

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Table 1.—Czechoslovakia: Production of selected mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Aluminum ingot including secondary e	60	60	62	62	65
Antimony e metric tons	2,000	2,000	2,000	2,000	2,000
Copper e do	NA	NA	5,000	5,000	5,000
Iron and steel:					
Iron ore (24 to 29 percent Fe)	3,411	2,846	r 2,446	r 2,237	e 2,000
Pig iron and blast furnace ferroalloys	5,254	5,716	r 5,868	r 6,269	e 6,400
Electric furnace ferroalloys	52	55	r 57	91	e 100
Steel ingots	7,598	8,377	8,598	9,128	e 9,800
Rolled products except pipe	5,100	5,663	6,094	6,518	e 6,700
Pipe	731	r 802	r 906	976	e 1,000
Lead:					
Mine (content of ore) e metric tons	13,500	13,500	14,000	14,000	14,000
Smelter e do	14,000	14,000	14,500	14,500	14,500
Manganese ore, 13–17 percent manganese	85	84	80	90	80
Mercury e 76-pound flasks	725	r 775	r 825	r 875	e 900
Silver e thousand troy ounces	2,400	2,400	2,400	2,400	2,400
Tin, mine (content of ore) e long tons	200	200	220	148	150
Nonmetals:					
Cement	5,178	5,493	5,713	r 6,130	e 6,200
Fertilizers:					
Nitrogenous (N content)	154	158	220	251	r 270
Phosphatic (P_2O_5 content)	203	241	258	261	e 280
Gypsum:					
Raw	302	351	r 331	r 356	NA
Calcined	22	23	r 22	23	NA
Kaolin	321	313	332	e 335	NA
Lime	2,254	2,347	2,488	2,464	e 2,500
Limestone	13,994	14,635	14,866	e 15,000	e 15,000
Magnesite, crude	r 1,481	r 1,686	r 1,841	r 1,901	2,107
Pyrite, gross weight	347	361	r 375	r 352	NA
Refractories:					
Dinas bricks	58	64	63	62	NA
Magnesite and chrome magnesite bricks	157	174	173	167	NA
Shamot bricks	430	r 434	r 440	485	NA
Salt	187	184	191	r 197	NA
Mineral fuels:					
Coal:					
Bituminous	28,296	28,314	27,731	26,728	e 25,800
Brown	69,326	71,472	73,216	r 74,108	e 65,000
Lignite	3,977	4,133			
Coal briquets	778	784	r 791	r 795	e 780
Coke:					
From brown coal	2,114	1,929	1,693	r 1,773	NA
From bituminous coal	9,299	9,421	9,496	r 9,465	NA
Gashouse	451	306	321	r 207	NA
Gas, natural million cubic feet	r 189,568	r 197,443	r 204,859	208,744	NA
Petroleum:					
Crude	180	195	r 192	r 190	NA
Refinery products:					
Kerosine	90	110	r 137	134	NA
Diesel fuel	1,653	1,779	2,072	2,242	NA
Lubricants	103	93	r 115	123	NA
Asphalt from all sources	344	398	407	529	NA

e Estimate. r Revised. NA Not available.

[1] In addition to the commodities listed, Czechoslovakia is believed to produce arsenic, silver, perlite, uranium, barite, feldspar, fluorspar, graphite, and silica.

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Table 2.—Czechoslovakia: Officially reported exports of selected mineral commodities

Commodity		1965	1966	Principal destinations in 1966
Metals:				
Steel:				
Rolled products, except pipe.	thousand metric tons	1,708	1,615	Hungary 165; Poland 128; West Germany 122.
Pipe	do	267	275	U.S.S.R. 129; Poland 43.
Nonmetals:				
Kaolin	do	170	166	Poland 49; West Germany 35; East Germany 14.
Magnesite	do	193	207	West Germany 58; Hungary 47; Poland 41.
Mineral fuels:				
Coal:				
Bituminous	do	2,378	2,077	East Germany 854; Hungary 572; Austria 268.
Brown	do	1,185	1,143	West Germany 1,059.
Coke	do	1,835	2,397	East Germany 818; Rumania 387; Hungary 287.

Table 3.—Czechoslovakia: Officially reported imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity		1965	1966	Principal sources in 1966
Metals:				
Iron and steel:				
Iron ore	thousand tons	9,553	9,336	U.S.S.R. 7,662; India 766; Brazil 355.
Pig iron	do	118	108	U.S.S.R. 100.
Manganese ore	do	334	287	U.S.S.R. 150; India 59.
Nonmetals:				
Asbestos		27,561	32,996	U.S.S.R. 15,750; Austria 1,925.
Fertilizers:				
Nitrogenous (N content)		50,000	41,000	Austria 15,000; East Germany 10,000.
Phosphatic (P_2O_5 content)		291,000	270,000	U.S.S.R. 175,000; Lebanon 17,000.
Potassic (K content)		359,000	403,000	East Germany 368,000.
Pyrite (S content)		120,000	49,000	U.S.S.R. 19,000; Yugoslavia 7,000.
Sulfur (elemental)		226,000	238,000	Poland 121,000; U.S.S.R. 37,000.
Mineral fuels:				
Coal bituminous	thousand tons	4,538	4,030	U.S.S.R. 2,051; Poland 1,975.

Source: Statisticka Rocenka C.S.S.R. 1967 (Statistical Yearbook of the C.S.S.R. for 1967), Prague 1967.

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Table 4.—Czechoslovakia: Imports of selected mineral commodities from the Soviet Union

(Metric tons unless otherwise specified)

Commodity		1965	1966
Metals:			
Aluminum:			
Metal		20,600	19,300
Rolled products [1]		6,613	8,382
Cadmium		115	205
Chromite		33,000	49,000
Copper:			
Unwrought		26,900	27,400
Rolled products		400	601
Iron and steel:			
Iron ore	thousand tons	7,966	7,662
Pig iron	do.	86	101
Ferroalloys	do.	21	45
Steel:			
Rolled products, except pipe		540,100	341,300
Pipe		2,100	1,800
Lead		14,600	19,700
Manganese:			
Ore		141,000	149,000
Peroxide		1,500	1,000
Nickel		1,400	2,400
Zinc		r 12,500	13,900
Nonmetals:			
Apatite:			
Ore		68,200	68,200
Concentrate		444,300	414,900
Asbestos	thousand tons	10,200	16,000
Cement	do.	40	1
Graphite		117	105
Pyrite		45	43
Sulfur:			
Elemental		25,000	37,500
Acid		5,300	15,000
Mineral fuels:			
Coal:			
Anthracite	thousand tons	321	316
Bituminous	do.	2,435	1,743
Coke	do.	7	5
Petroleum:			
Crude	do.	5,964	6,396
Refinery products:			
Gasoline	do.	138	227
Kerosine	do.	237	250
Diesel fuel	do.	16	18
Paraffin	do.	r 3	2
Others	do.	8	7
Total		r 402	504

r Revised.
[1] Include alloyed.

Source: Vneshnyaya Torgovlya S.S.S.R. za 1966 god (Foreign Trade of the U.S.S.R. for 1966) Moscow, 1967 334 pp.

COMMODITY REVIEW

METALS

Iron Ore.—Preliminary steps of the new economic management program resulted in reduced iron ore production during 1967. The closing of several unprofitable mines may have reduced ore output by as much as 10 percent under that of the previous year. Domestic ore production satisfied less than one-fifth of the steel industry's growing demand and the production decline was balanced by import increases.

Iron and Steel.—Expansion and modernization activity in the iron and steel industry was directed toward attaining a 12 million ton ingot steel capacity by 1970. This goal is to be realized by construction of new facilities within the East Slovakian Iron and Steel Works near Kosice, and by better utilization of existing facilities through improvements and modernization. Overall blast furnace capacity is to be increased by replacing smaller furnaces with furnaces having capacity of 1,083 and 1,719 cubic meters. Two blast furnaces of 1,719-cubic-meter capacity each began operation at the East Slovakian Iron and Steel Works during 1967.

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Czechoslovakia's production of oxygen converter steel was initiated at the East Slovakian Iron and Steel Works in 1966 and was to be further expanded during 1967; by 1970 oxygen converters are also slated to be in operation at the Kladno Steel Works. The modernization program at Kladno also includes the installation of electric furnaces, which should result in the increased production of higher quality and alloy steels. The range and size of steel products are to be increased with an emphasis on sheet and strip output.

In mid-1967, Czechoslovakia's first continuous heat galvanizing line was opened at the East Slovakian Works with an hourly capacity to galvanize up to 20 metric tons of plate in widths up to 1,550 millimeters.

Table 5.—Salient statistics on iron and steel production

(Thousand metric tons unless otherwise specified)

	1960	1965	1966
Pig iron:			
Number of blast furnaces	21	23	22
Production of pig iron and ferroalloys:			
Pig iron for steelmaking	4,115	5,129	5,559
Pig iron for foundry	515	646	661
Blast furnace ferroalloys	66	93	49
Total	4,696	5,868	6,269
Materials consumed per ton of pig iron:			
Iron ore kilograms	831	502	504
Sinter do	855	1,289	1,329
Manganese ore do	49	58	(1)
Scrap do	79	69	52
Coke do	910	739	684
Limestone do	444	285	220
Ingot steel:			
Number of open hearth	NA	[2] 73	NA
Production of crude steel:			
Open hearth	5,702	7,201	7,402
Bessemer	247	237	242
Electric furnace	819	1,161	1,209
Oxygen convertor	-----	-----	275
Total	6,768	8,599	9,128
Materials consumed per ton of crude steel:			
Pig iron kilograms	613	595	626
Scrap do	447	474	492

NA Not available.
[1] Included with iron ore.
[2] Six 400-ton capacity; six 200 to 400-ton capacity; fifteen 100 to 200-ton capacity and remainder under 100-ton capacity.

NONMETALS

Nonmetallic mineral production reportedly made significant gains during 1967, although detailed commodity statistics were not issued in time for inclusion in this report. Development, expansion, and modernization activities continued in virtually all segments of the industry. Fertilizer production continued to increase, and a further major rise is expected in 1968 when the 250,000 ton-per-year capacity Lovosice fertilizer plant is slated to go into operation. Facilities for magnesite and perlite production were undergoing modernization, and development work continued on the 5-million-ton-annual-capacity limestone quarry at Vcelary. Geological exploration for additional fluorspar deposits was conducted. Undisclosed production of fluorspar was derived from the Hradiste, Harrachov, and Vrchoslav areas.

MINERAL FUELS

Although domestic gas production and crude petroleum imports continued to grow steadily, over 80 percent of the nation's energy supply was derived from bituminous coal, brown coal, and lignite. Czechoslovak consumption of solid fuels was reported at 96 million tons in 1966 and it is expected to increase to 120 million tons by 1980. The percentage distribution of commercial solid fuels consumption by industrial sector is given in the following tabulation:

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Fuel and consuming sector	1960	1965	1966
Bituminous coal:			
Coke production	39.9	43.3	44.8
Electric energy production	20.6	18.1	18.7
Industrial heat and steam production	13.5	17.4	17.2
Gas production	2.7	1.4	.9
Transportation	8.6	7.6	7.3
Marketed	3.5	3.9	3.6
Other	11.2	8.3	7.5
Total	100.0	100.0	100.0
Brown coal and lignite:			
Electric energy production	29.4	32.1	33.5
Industrial heat and steam production	19.3	22.7	23.2
Briquet production	1.2	1.8	1.9
Chemical industry	7.0	4.6	4.9
Transportation	10.8	5.9	5.4
Marketed	17.4	18.9	18.3
Other	14.9	14.0	12.8
Total	100.0	100.0	100.0

Coal.—Profit-oriented industrial reforms have resulted in the closing of approximately 45 submarginal or marginal pits between 1965 and yearend 1967, displacing an estimated 12,000 workers. While production has declined during this transition period, increased mechanization in remaining collieries and pits, and development of new deposits near Bilina and Frenstat should restore output to the 1964 peak level by 1970.

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The Mineral Industry of Finland

By F. L. Klinger [1]

There were a variety of significant developments in Finland's mineral industry in 1967. Completion of basic production units at the Raahe steelworks in October was expected to substantially reduce Finnish imports of steel in 1968. Petroleum refinery capacity was again being increased, with a goal of 8.5 million tons by 1969. Copper production rose, and two more mines were scheduled for production by 1971. Increased utilization of domestic pyrite resources resulted from completion of a cobalt plant at Kokkola. There were also important developments in chromite, vanadium, rare-earth oxides, zinc, phosphate and fertilizers, and feldspar production.

Several economic developments during the year affected the mineral industry. Wages increased about 6 percent and were expected to rise another 8 percent in 1968. Increased interest rates on loans for residential construction and withdrawal of tax relief in early 1967 tended to depress construction material output. Devaluation of the markka on October 12 decreased the currency's exchange value by 31 percent, and a week later the Government levied a tax of up to 14 percent on exports. The maximum rate applies to those commodities requiring the least foreign materials to produce. The tax may be reduced by the Government in certain cases, but normally it will be reduced at 3-month intervals until it is abolished at yearend 1969. The combination of the export tax with devaluation of the British pound on November 18 made it theoretically unprofitable to export certain commodities to the United Kingdom.

PRODUCTION

The relative volumes of production by major sectors of the mineral industry in the last 3 years are shown by the following indices:

Industry sector	(1959=100)		
	1965	1966	1967
Mines and quarries [1]	146	131	139
Primary metal plants [1]	221	222	221
Nonmetallic mineral product plants [1]	201	214	213
Petroleum refineries [e]	342	376	405

[e] Estimate.
[1] Source: Central Bureau of Statistics (Helsinki). Bulletin of Statistics (Tilastokatsauksia), No. 2, 1968.

Available data indicated substantial increases in output of copper, vanadium, sulfur, feldspar, and petroleum products in 1967, while production of other important commodities remained relatively unchanged from 1966 levels.

[1] Physical scientist, Division of International Activities.

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Table 1.—Finland: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Chromite ore	---	---	---	70,000	30,000
Cobalt,[1] mine	1,974	1,684	1,493	e1,400	e1,250
Copper:					
Concentrate	155,079	147,842	129,858	120,078	NA
Metal content of concentrate	33,900	32,300	29,800	26,390	NA
Cathodes	37,797	33,177	30,522	31,912	34,198
Sulfate (metal content)	228	e220	e176	e180	NA
Gold, troy ounces	20,416	22,055	18,037	15,465	e14,000
Iron and steel:					
Iron ore:					
Magnetite concentrate (56 to 68 percent iron), thousand tons	362	r480	658	r656	643
Pyrite concentrate:					
Kokkola product (65 to 68 percent iron), do	152	204	227	324	NA
Other roasted (50 to 60 percent iron e)[2], do	167	125	108	NA	NA
Pig iron and ferroalloys, do	r836	r592	r934	r934	1,038
Steel, crude, do	r826	371	363	399	394
Rolled products, do	286	328	351	366	340
Lead:					
Concentrate	1,645	3,009	9,596	7,991	e7,000
Metal content	1,145	1,890	6,307	4,633	e4,200
Nickel:					
Concentrate	54,439	58,773	55,318	52,163	NA
Metal content of concentrate	2,930	3,170	2,950	2,952	NA
Electrolytic	2,694	2,943	2,776	2,993	e2,900
Sulfate, metal content	156	147	163	185	e160
Rare earth oxides	NA	NA	NA	43	NA
Selenium, kilograms	6,993	6,577	5,705	5,431	e6,100
Silver, thousand troy ounces	580	608	582	520	NA
Titanium:					
Ilmenite concentrate (44 percent titania)	93,858	116,063	107,000	117,560	e125,000
Dioxide e	16,000	r19,000	r22,000	22,000	22,000
Vanadium pentoxide	1,248	1,756	1,721	1,733	e2,100
Zinc:					
Concentrate	119,988	114,510	126,638	100,800	e105,000
Metal content of concentrate	66,353	62,991	69,010	54,375	e56,500
Nonmetals:					
Asbestos	9,254	10,533	12,072	12,020	e12,000
Cement, thousand tons	1,428	1,572	r1,770	1,557	1,514
Diatomite	2,300	2,170	950	1,200	e1,000
Feldspar	12,880	r14,900	11,872	r26,317	e35,000
Fertilizer, phosphatic, (20 percent P_2O_5)	r446,400	r514,300	r437,400	540,500	395,000
Lime, unslaked, thousand tons	208	240	245	227	NA
Limestone and dolomite, do	3,200	3,500	3,800	3,553	e3,500
Marble	600	800	200	NA	NA
Pyrite, thousand tons	541	547	582	516	NA
Quartz	30,000	28,500	35,312	43,670	e45,000
Soapstone, square meters	800	964	e900	e1,000	NA
Sulfur:					
Content of pyrite	227,800	262,254	282,100	264,800	NA
Elemental, recovered from pyrite	38,214	68,139	73,771	73,641	e75,000
Sulfuric acid (100 percent)	333,200	355,564	383,208	480,200	549,200
Talc	6,756	6,000	7,000	5,000	NA
Wollastonite	2,000	3,000	2,393	3,813	3,500
Mineral fuels:					
Coke, thousand tons	165	145	142	153	NA
Gas (manufactured), thousand cubic meters	77,325	68,411	70,103	76,342	72,492
Peat (water content 35 percent), thousand tons	83	76	69	69	3 e70
Fuel briquets, do	18	17	28	25	e25
Petroleum refinery products:[3]					
Gasoline, do	526	553	700	762	NA
Kerosine, do	17	13	13	13	NA
Distillate fuel oil, do	396	421	1,640	2,658	e3,700
Residual fuel oil, do	992	1,048			
Liquefied petroleum gases, do	31	34	42	52	NA
Bitumen and other, do	167	292	231	221	NA
Total refinery products, do	2,129	2,361	2,626	3,706	e4,700
Total crude oil processed, do	2,256	2,554	2,772	3,714	e4,900

e Estimate. r Revised. NA Not available.

[1] Source: United Nations, Statistical Yearbook, 1966, p. 187, (1963–1965 figures).

[2] Exports.

[3] Source: Neste Oy. Statistical office.

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TRADE

Trade in most mineral commodities in 1967 did not appear to have changed significantly from the levels of 1966; an apparent 70-percent increase in crude oil imports resulting from refinery expansion was partly compensated for by reduced refinery product imports. Exports of vanadium, several nonmetals, and petroleum products increased while significant reductions appeared to occur in cobalt-bearing pyrite residues, copper, titanium dioxide, and cement. Imports of solid fuels and some nonmetallic commodities increased but imports of iron ore, copper, lead, and sulfur during the first 11 months were running 25 to 30 percent less than in the corresponding period of 1966.

The relative importance of mineral commodities in Finland's total commodity trade is shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Export:			
1965	r 99	1,427	6.8
1966	116	1,506	7.7
Import:			
1965	r 400	1,646	r 24.3
1966	413	1,726	23.9
Trade balance:			
1965	r −301	−219	XX
1966	−297	−220	XX

r Revised.
XX Not applicable.

Sweden continued to be the principal destination of Finnish exports in 1966 on a value basis, accounting for 23 percent of the total, followed by West Germany with 16.5 percent, the Soviet Union with 8 percent, and the United Kingdom with 7.4 percent. As in 1965, the Soviet Union supplied most of Finland's fuel and accounted for nearly 40 percent of the value of all mineral commodity imports. Imports from the United Kingdom, West Germany, and Sweden were nearly equal in value and together they contributed 30 percent of the total.

Values of the major items in Finland's mineral commodity trade in 1965 and 1966 are tabulated as follows:

	Value (million dollars)	
	1965	1966
Exports:		
Iron and steel [1]	43.4	40.7
Copper	17.3	35.6
Zinc ore	12.0	9.0
Titanium [2]	8.9	9.0
Nickel	4.7	5.3
Vanadium (compounds)	3.3	4.2
Other	9.4	12.2
Total	99.0	116.0
Imports:		
Iron and steel [1]	134.2	126.8
Aluminum	14.9	17.6
Copper	16.3	20.7
Lead and zinc	6.4	7.1
Fertilizer materials	32.6	20.9
Crude petroleum	36.5	44.6
Solid fuels	43.9	37.0
Petroleum products	77.6	98.6
Other	37.6	39.7
Total	400.0	413.0

[1] Includes iron ore and scrap.
[2] Ilmenite and titanium dioxide.

Table 2.—Finland: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum, all forms [1]	1,555	2,205	Sweden 851; West Germany 360; Denmark 282.
Copper: [1]			
Scrap	---	65	Sweden 63.
Unwrought	5,051	13,444	West Germany 6,931; France 2,214; Netherlands 1,527.
Semimanufactures	8,921	11,263	Sweden 5,376; Norway 2,078.
Iron and steel:			
Iron ore	168,878	142,163	Poland 88,378; Czechoslovakia 29,025.
Roasted pyrite and pyrrhotite	107,567	70,008	All to West Germany.
Scrap	3,085	3,608	West Germany 1,947; Japan 1,041.
Pig iron, including cast iron	r 797,179	783,798	Sweden 264,199; United Kingdom 113,847; U.S.S.R. 101,524.
Ingots and other primary forms	7,095	12,514	West Germany 6,865; Pakistan 2,080; Sweden 1,377.
Semimanufactures	23,197	21,382	Sweden 7,198; Denmark 5,876; Norway 4,454.

See footnotes at end of table.

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Table 2.—Finland: Exports of mineral commodities—Continued

(Metic tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Lead:			
Ore and concentrate	9,527	10,449	West Germany 5,853; Belgium-Luxembourg 4,596.
Nickel:			
Unwrought	2,548	2,626	Netherlands 654; Sweden 520; West Germany 322; France 317.
Semimanufactures	104	190	Switzerland 140; China (mainland) 42.
Silver and platinum-group metals:			
Ore and concentrate	7	8	Sweden 6.
Metal—troy ounces	3,311	5,498	United Kingdom 4,308; West Germany 1,157.
Tin,[1] unwrought, including scrap—long tons	50	70	Norway 40.
Titanium:			
Ilmenite concentrate	84,016	50,665	Italy 39,563; Czechoslovakia 11,101.
Dioxide	19,848	21,448	United States 10,300; Sweden 2,728.
Vanadium compounds	2,088	2,130	NA.
Zinc ore and concentrate	147,628	112,542	Belgium-Luxembourg 58,126; West Germany 30,976.
Other:			
Ashes and residues containing nonferrous metals	849	8,834	West Germany 7,823.
Alkali and rare earth metals	3	9	Common Market 2; United Kingdom 1; Japan 1.
Base metals, n.e.s	---	31	Sweden 30.
Metalloids, n.e.s	9	5	All to United Kingdom.
Chemical elements, n.e.s	30	2	NA.
Inorganic bases, oxides, n.e.s	3,564	5,167	Sweden 3,272.
Nonmetals:			
Asbestos:			
Crude fiber	8,562	8,528	United States 2,725; West Germany 2,154; Sweden 1,712.
Asbestos board	586	---	
Cement	101,327	27,738	Sweden 27,705.
Clay and refractory building materials (brick tile, etc.)—value, thousands	$346	$268	Sweden $256.
Diamond, industrial—carats	5,000	---	
Diatomaceous earth	243	137	Sweden 131.
Fertilizer, phosphatic	---	100,276	All to U.S.S.R.
Feldspar	9,007	20,896	United Kingdom 6,971; East Germany 5,106.
Lime	4,055	502	NA.
Mica, including waste and splittings	95	25	All to Sweden.
Precious, semiprecious stones, n.e.s.—value, thousands	---	$18	Switzerland $14.
Pyrite	62,642	51,230	All to West Germany.
Quartz	---	1,214	Sweden 1,199.
Stone, sand and gravel:			
Building stone, unworked and worked	9,971	7,830	West Germany 2,008; United States 1,297; France 1,219.
Other calcareous stone	4,525	4,357	Sweden 3,830.
Sand, gravel, and crushed stone	10,889	430	Mainly to Sweden.
Sulfur	2,506	1,230	All to Sweden.
Other mineral materials:			
Slag, ash, etc., not metal bearing	8,715	10,050	West Germany 7,542; Norway 2,468.
Other	457	---	
Mineral fuels:			
Coal, excluding briquets	15,213	10,467	All to Sweden.
Coke	13,757	8,913	Sweden 8,275.
Peat and briquets	277	347	West Germany 165.
Petroleum refinery products:			
Gasoline	166	19,647	West Germany 15,700.
Kerosine	1	---	
Distillate fuel oil	60	9	NA.
Residual fuel oil	81	---	
Liquefied petroleum gas	915	1,614	Sweden 1,043; Denmark 571.
Lubricants, including grease	149	75	Sweden 32.
Bitumen and other	r356	177	Sweden 168.

r Revised. NA Not available.
[1] Including alloys.

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Table 3.—Finland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	128	---	
Oxide and hydroxide	13,773	13,740	Hungary 5,843; West Germany 3,629.
Unwrought, including scrap [1]	8,243	11,977	U.S.S.R. 7,744; Norway 1,596.
Semimanufactures	12,384	13,922	Sweden 5,336; United Kingdom 2,086 Belgium-Luxembourg 1,052.
Arsenic oxides	558	447	All from Sweden.
Beryllium	1	1	NA.
Chromium:			
Chromite	65	76	All from Republic of South Africa.
Oxide and hydroxide	677	583	West Germany 372.
Cobalt: Oxide and hydroxide	4	4	All from United Kingdom.
Copper: [1]			
Unwrought	11,404	11,446	United Kingdom 3,254; Zambia 2,179; Chile 1,473.
Semimanufactures	3,809	4,457	United Kingdom 2,064; Chile 870; West Germany 659.
Scrap	865	302	West Germany 201; Switzerland 101.
Iron and steel:			
Iron ore	970,117	837,314	Sweden 529,512; Norway 283,371.
Oxide and hydroxide	1,094	1,142	West Germany 865; United Kingdom 169.
Scrap	138,903	122,551	U.S.S.R. 110,768.
Pig iron, including cast iron	1,261	2,773	Norway 2,738.
Powder sponge, shot, etc	1,633	2,232	Sweden 1,237; United Kingdom 941.
Ferroalloys	10,981	9,475	U.S.S.R. 4,646; Norway 3,424; Sweden 469.
Ingots and other primary forms	60,512	62,814	U.S.S.R. 25,183; Norway 15,052; Sweden 12,123.
Semimanufactures:			
Bars, rods, sections	144,658	141,052	Sweden 25,714; West Germany 25,495; Poland 24,853.
Plates and sheet	r 340,298	380,913	U.S.S.R. 111,329; United Kingdom 80,893; West Germany 37,506.
Hoop and strip	28,461	30,975	West Germany 10,400; United Kingdom 7,540; Belgium-Luxembourg 4,798.
Rails and accessories	883	1,161	West Germany 639; United Kingdom 165.
Wire	16,072	16,577	United Kingdom 3,512; Sweden 3,331; West Germany 3,200.
Tubes and pipes	87,028	80,704	West Germany 31,898; France 13,083; Sweden 9,502.
Castings and forgings	553	299	Sweden 150; Austria 87.
Lead:			
Ore and concentrate	451	---	
Unwrought	10,224	14,392	U.S.S.R. 6,702; Republic of South Africa 2,429; United Kingdom 1,963.
Semimanufactures [1]	549	1,233	West Germany 806; Belgium-Luxembourg 213.
Oxide	590	641	Sweden 481; United Kingdom 125.
Magnesium, unwrought	28	17	NA.
Manganese:			
Ore	93,903	59,006	U.S.S.R. 30,780; Sweden 12,823; Belgium-Luxembourg 10,300.
Oxide	351	574	Netherlands 150; Republic of South Africa 149.
Mercury, 76-pound flasks	1,537	1,015	United States 435; Netherlands 145; Spain 116.
Molybdenum	3	4	West Germany 2; Austria 2.
Nickel:			
Ore and concentrate	63	---	
Unwrought [1]	267	253	United Kingdom 179; U.S.S.R. 59.
Nickel-alloy scrap	468	395	West Germany 297.
Semimanufactures	162	186	Switzerland 79; United Kingdom 47; West Germany 42.
Silver, thousand troy ounces	456	1,838	U.S.S.R. 643; West Germany 617; United Kingdom 481.
Platinum-group metals, do	6	6	Sweden 2; U.S.S.R. 2; West Germany 1.
Tin: [1]			
Unwrought, long tons	442	361	China (mainland) 194; United Kingdom 65.
Oxides	22	19	All from United Kingdom.
Semimanufactures, long tons	27	44	United Kingdom 18; West Germany 18.
Titanium dioxide	1,412	768	Japan 330; Norway 191; West Germany 126.
Tungsten, unwrought and semimanufactures	6	5	United Kingdom 3.
Uranium and thorium, kilograms	1,518	---	

See footnotes at end of table.

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Table 3.—Finland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Zinc: [1]			
Oxides	424	318	East Germany 103; United Kingdom 64.
Dust (blue powder)	169	153	United Kingdom 48; West Germany 47; Norway 35.
Unwrought, including scrap	r 7,894	7,097	Belgium-Luxembourg 3,187; U.S.S.R. 1,600; United Kingdom 1,025.
Semimanufactures	306	408	West Germany 157; Belgium-Luxembourg 100.
Other metals, metallic ores and chemicals, not elsewhere specified:			
Ores and concentrates of base metals	333	355	Australia 152.
Metalliferous nonferrous waste	---	1,030	All from Canada.
Base metals	69	150	United Kingdom 55; Sweden 41; U.S.S.R. 30.
Metalloids	201	192	Sweden 140; West Germany 48.
Pyrophoric alloys	2	2	Austria 1.
Chemical elements	3	333	NA.
Oxides of strontium, barium and magnesium	5,215	4,874	Netherlands 2,768; China (mainland) 1,000.
Nonmetals:			
Abrasives, natural, other than diamond	1,064	1,191	United States 747.
Asbestos:			
Crude	7,478	6,393	U.S.S.R. 2,672; Canada 1,561; Republic of South Africa 1,138.
Asbestos and other fiber-cement articles	1,204	101	NA.
Barite, including witherite	601	516	West Germany 478.
Boron compounds:			
Borates, natural, crude	2,370	2,428	All from United States.
Boric oxide, acid	117	190	France 146.
Cement	13,759	8,334	United Kingdom 3,629; Denmark 3,292.
Chalk	8,519	11,398	France 4,784; Denmark 3,944.
Clays:			
Kaolin and other	208,289	239,272	United Kingdom 202,752.
Construction materials (brick, tile, etc.):			
Refractory	23,650	20,857	West Germany 4,728; Sweden 4,582; Austria 4,191.
Nonrefractory value, thousands	$814	$916	Sweden $362; West Germany $145; Denmark $129.
Corundum (synthetic)	88	110	NA.
Cryolite and chiolite, natural	64	47	All from Denmark.
Diamond and other precious, semiprecious stones:			
Diamond:			
Industrial—thousand carats	40	45	Belgium-Luxembourg 25; United Kingdom 15.
Nonindustrial, unset—do	20	65	Belgium-Luxembourg 20; Switzerland 10.
Other, including synthetic kilograms	2,383	2,579	West Germany 862.
Dolomite	7,566	6,307	Belgium-Luxembourg 4,812; Hungary 608; Norway 520.
Earth pigments	459	115	West Europe 81.
Feldspar and fluorspar	r 7,289	5,957	Netherlands 1,232; United Kingdom 1,202; Norway 1,039.
Fertilizer materials:			
Crude:			
Raw phosphate	366,753	387,149	U.S.S.R. 270,279; Morocco 116,870.
Manufactured:			
Fertilizer:			
Nitrogenous	157,126	121,981	West Germany 62,583; Norway 57,009.
Phosphatic:			
Basic slag	15,451	11,349	All from Sweden.
Other	145,896	1,598	All from Netherlands.
Potassic	223,282	188,269	East Germany 61,073; U.S.S.R. 59,856; West Germany 45,199.
Other	57,582	3,293	Netherlands 3,190.
Other (anhydrous ammonia)	2,618	13,409	United States 11,264.
Graphite	430	393	West Germany 150; Poland 150.
Gypsum and anhydrite, including plasters	132,930	109,190	Poland 65,830; U.S.S.R. 20,185; East Germany 18,957.
Lime	35	30	NA.
Limestone, for cement, flux, etc	206,448	184,671	Sweden 180,723.
Magnesite	2,030	2,088	Austria 1,434; Netherlands 457.

See footnotes at end of table.

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Table 3.—Finland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Mica:			
Crude	478	743	Republic of South Africa 337; United Kingdom 297.
Manufactures	31	21	United Kingdom 16.
Quartz and quartzite	4,418	4,767	Netherlands 1,414.
Salt	325,875	376,010	Netherlands 181,697; East Germany 52,381; U.S.S.R. 47,490.
Other:			
Sodium and potassium compounds:			
Caustic soda	227	2,293	Belgium-Luxembourg 820; United Kingdom 500; Netherlands 500.
Caustic potash	524	354	West Germany 141.
Stone, sand and gravel:			
Building stone, including worked stone	977	2,042	Italy 711; Switzerland 482; Denmark 310.
Sand	85,082	98,104	Belgium-Luxembourg 69,183; Sweden 16,620.
Gravel and crushed stone	1,728	1,367	Switzerland 533; Denmark 390.
Sulfur:			
Elemental, all forms	r 72,388	78,952	United States 43,081; France 25,169.
Sulfuric acid, including oleum	45,353	19,856	Sweden 18,659.
Talc and steatite	4,462	4,994	China (mainland) 2,025; Norway 1,571; United States 847.
Other, not elsewhere specified:			
Slag, scale, ash, etc	54,741	48,838	Sweden 40,340; Belgium-Luxembourg 4,550.
Mineral substances	5,991	4,613	United Kingdom 2,753; Czechoslovakia 1,006.
Other inorganic acids	979	975	West Germany 586.
Mineral fuels:			
Asphalt and bitumen, natural, crude	198	310	United Kingdom 182.
Carbon black	2,686	3,451	Netherlands 1,795; United Kingdom 1,026.
Coal excluding briquets thousand tons	2,517	2,043	Poland 1,461; U.S.S.R. 578.
Coal tar and other derivatives do.	56	63	United Kingdom 50.
Coke do.	832	727	U.S.S.R. 577; Poland 66; West Germany 46.
Lignite and briquets	2,781	4,775	All from East Germany.
Petroleum:			
Crude and partly refined thousand tons	2,308	2,901	U.S.S.R. 2,155; Iran 746.
Refinery products:			
Gasoline	19,930	19,430	Netherlands 7,360; United States 5,500.
Kerosine, including white spirit	r 25,870	31,720	U.S.S.R. 10,150; United States 7,100; United Kingdom 4,050.
Distillate fuel oil thousand tons	1,690	2,314	U.S.S.R. 2,165.
Residual fuel oil do.	1,193	1,617	U.S.S.R. 1,343; Rumania 173.
Liquefied petroleum gases	1,304	2,136	Netherlands 1,833.
Lubricants, including grease	66,915	80,075	United Kingdom 38,173; Sweden 20,019; U.S.S.R. 9,884.
Petroleum jelly and wax	10,940	10,803	West Germany 6,640; Rumania 1,147.
Bitumen and other	162,000	140,673	Venezuela 115,570.

r Revised. NA Not available.
1 Including alloys.

COMMODITY REVIEW

METALS

Chromite.—The chromite mine developed in the Elijärvi area east of Kemi by Outokumpu Oy. was operated at reduced capacity in 1967, while construction of the company's ferrochromium plant was continued at Tornio. Ferrochromium production was expected to begin in the summer of 1968, with a final output capacity of 30,000 tons annually. Imports of chromium ferroalloys in 1967 were 1,362 tons.

Cobalt.—The 1,200-ton-per-year plant for recovery of cobalt from pyrite at the Kokkola works of Outokumpu Oy. was completed in 1967. Although no production data for cobalt metal was available, a 90-percent reduction in exports of roasted pyrite in 1967 appeared to indicate that

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this material, previously shipped to West Germany and containing about 0.6 percent cobalt, is now being processed in Finland.

Copper.—The 1967 increase in electrolytic copper output was partly due to a full year's production of ore from the Virtasalmi (Karsikumpu) open pit mine which began production in December 1966. This property, about 25 kilometers southwest of Varkaus, reportedly contains 1 million tons of ore with an average copper content of 1.25 percent. The mine was expected to yield about 7,000 tons of concentrate annually and should compensate for the loss of production from the Ylöjärvi mine which was closed in mid-1966. The Outokumpu Company, which accounted for all copper production through yearend, was also developing the Vuonos orebody, about 5 kilometers east of the Outokumpu mine, for initial production in 1971. The Vuonos ore reportedly contains about 3 percent copper. At its Harjavalta smelter, the company began recovery of copper from slag in September 1966.

Development of the Luikonlahti copper deposit in Kuopio province was continued by Malmikaivos Oy., which plans to mine about 400,000 tons of ore annually beginning in late 1968.

A sulfide deposit near Pielavesi in central Finland was estimated by the Geological Research Institute to contain 1.5 to 2 million tons of pyrite-pyrrhotite ore with an average copper content of 1 percent.

Iron Ore.—Total iron ore output apparently increased in 1967 although two of the country's four conventional mines were scheduled to close in the fall. Domestic consumption also increased while at the end of November imports were 30 percent less and exports had also declined. Increased concentrate production was likely at Kokkola, Raajärvi, and possibly at Otanmäki.

The mines reportedly scheduled to close were the Jussarö mine of Oy. Vuoksenniska Ab. in southwest Finland, and the Kärväsvaara mine operated by Otanmäki Oy. in the far north. Output at Jussarö in 1966 was 125,000 tons of concentrate from 312,000 tons of crude ore, and at Kärväsvaara 75,000 tons of concentrate from 156,000 tons of crude ore.

Output of the Raajärvi mine, 8 kilometers west of Kärväsvaara, was expected to increase in mid-1967 upon completion of underground development work. The mine has been an open pit operation since production began in 1964. Output in 1966 was 237,000 tons of concentrate from 476,000 tons of crude ore.

Iron and Steel.—The new steel works of Rautaruukki Oy. at Raahe was officially inaugurated in October. Completion of this plant increased national crude steel productive capacity by an estimated 200 percent, bringing Finland theoretically close to self-sufficiency. The principal new installations were two 60-ton oxygen converters, three continuous casting machines for slabs, and a plate mill with an annual productive capacity of 400,000 tons. The plant's blast furnace has been in production since 1964. The works' annual production for sale is expected to include 250,000 tons of pig iron and 300,000 tons of steel plate, divided about equally between domestic consumption and export. Apparent annual consumption of steel was estimated at 1 million tons.

Output of iron and steel was only moderately increased during the last 3 months of 1967. Earlier in the year, the Vuoksenniska Company reportedly reduced its 1967 production schedule for pig iron by 10 percent at Turku, and for steel by 20 percent at Imatra. The latter development appeared to be responsible for the decline in production of rolled products in 1967.

Lead and Zinc.—Production of lead concentrates appeared to decline in 1967 and exports at the end of November were running about 20 percent less than in 1966. Approximately 70 percent of the mine lead produced in 1966 came from the Korsnäs mine and the remainder from Vihanti. The Vihanti and Pyhäsalmi mines, operated by the Outokumpu Company, accounted for most of the zinc production. In 1967 the Outokumpu Company was reportedly planning to build a zinc smelter at its Kokkola works.

Manganese.—Large, low-grade deposits of manganese were reportedly discovered near Kittilä in northern Finland in 1967. The deposits were reported to extend for 25 kilometers and to contain 9 percent manganese and 25 percent iron, but subsequent reports indicated the manganese content to be less than 5 percent.

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Nickel.—A nickel recovery unit was reportedly being installed at the Kokkola works by the Outokumpu Company, although no details were available.

Rare-Earth Metals.—Typpi Oy., a State-owned nitrogen and fertilizer company and the only commercial producer of rare-earth oxides in Finland, was expanding the capacity of its Oulu plant to produce 400 to 500 tons of oxides annually. Construction began in November 1966. The Outokumpu Company, which recovers a lanthanide concentrate as a byproduct of lead ore from its Korsnäs mine, was to supply raw materials. This mine yielded 2,610 tons of concentrate containing 2.6 percent rare-earth oxides in 1966.

Previously, the Oulu plant had an annual productive capacity of 100 tons of rare-earth oxides and production was apparently based on apatite imported from the Soviet Union. The company processed 31,000 tons of apatite in 1966.

A fuel cell using praesodymium as solid electrolyte was developed at the Institute of Technology in Helsinki. The cell was claimed to generate electric energy more efficiently than has previously been possible, achieving an efficiency ratio of 50 to 70 percent.

Titanium.—Titanium dioxide was produced by Vuorikemia Oy., a subsidiary of the State manufacturer of sulfuric acid, from ilmenite mined at Otanmäki. About 84 percent of the company's titania output in 1966 was exported. Based on 11-month figures, exports of both titania and raw ilmenite declined in 1967. Titania shipments to the United States declined by 20 percent.

New grades of titania were marketed by Vuorikemia in 1966, and this apparently led to virtual elimination of imports, which reportedly totaled only 10 tons in the first 11 months of 1967.

Vanadium.—The 20-percent increase in output of vanadium pentoxide in 1967 was the result of expanded facilities for treatment of magnetite concentrates at the Otanmäki mine. The expansion was begun by the Otanmäki Company in 1965.

NONMETALS

Cement and Other Construction Materials.—Activity in the construction industry in 1967 appeared to be less than that of 1966. Increased building construction, particularly in residential housing, was apparent in 1966 but slackened after the turn of the year due to withdrawal of tax reliefs and a rise in interest rates in 1967. Highway construction was close to the 1966 level since the $104 million budgeted by the Government was augmented by a $20 million loan from the World Bank.

Imports of stone, sand and gravel, and refractory construction materials increased 10 to 50 percent compared with those of 1966, while trade in cement and lime was relatively static. While output of cement declined slightly, Paraisten Kalkkivuori Oy., the principal producer, was expanding capacity of its Lappeenranta plant by 200,000 tons. Status of the company's project in Kolari was uncertain.

Feldspar, Quartz, and Mica.—Output of feldspar probably increased substantially in 1967, with concurrent increases in byproduct quartz and possibly mica. Exports of feldspar continued to rise and imports of quartz dropped sharply during the first 11 months of the year. These developments were attributed to completion of a $2.5 million feldspar flotation plant at Kimito (Kemiö) by Lohjan Kalkkitehdas Oy. The plant was designed to produce 70,000 tons annually of high-purity feldspar. The product, which was marketed as Finnish Flotation Feldspar (FFF), was available in glass, enamel, and ceramic grades.

The deposit being mined is a pegmatite dike containing about 70 percent feldspar, 20 percent quartz, and 5 to 10 percent mica. The dike is estimated to contain 1.2 million tons of feldspar, and several others of similar composition reportedly occur in the immediate vicinity.

Fertilizer Materials.—Two state-owned chemical and fertilizer companies, Typpi Oy. and Rikkihappo Oy., and possibly a third company, will be shareholders in a new State firm being formed to exploit the apatite deposits at Siilinjärvi in eastern Finland. The deposits were leased from Lohjan Kalkkitehdas Oy. in 1965.

Additional plants for sulfuric and nitric acids manufacture were completed at Uusikaupunki (Nystad) by Rikkihappo Oy. in 1966, and the productive capacity for manufactured fertilizer was raised to 300,000 tons annually by 1967. The company's fertilizer sales in 1966 were valued at $62 million. Nitrogenous materials were

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largely supplied by Typpi Oy., which plans to construct facilities to produce 250,000 tons of ammonia and 100,000 tons of urea annually from feedstocks to be supplied by the State petroleum refinery.

Graphite.—Lohjan Kalkkitehdas Oy. was reported to have had favorable results from explorations for graphite at Utajärvi, and in 1967 the company was granted additional concessions for graphite prospecting at Merijärvi.

Pyrite and Sulfur.—Mining and processing of pyrite probably increased substantially in 1967. Production of pyrite ore at the Vihanti mine was scheduled to begin in midyear at the rate of 240,000 tons annually. As compared with that of 1966, sulfuric acid output increased about 15 percent and pyrite exports declined by 30 percent.

Elemental sulfur exports were sharply increased and imports declined by about 30 percent.

Sulfur consumption by the paper and chemical industries in 1964 was estimated at approximately 400,000 tons.

Talc and Soapstone.—Investigations of talc from Sotkamo as a substitute for kaolin in the domestic paper industry were presumably continued. Consumption of imported kaolin by this industry was estimated at more than 100,000 tons annually. Imports may be reduced by one-third if the substitution is feasible.

The Nunnanlahti soapstone mine was erroneously reported closed in 1965. The mine was sold in 1965 by Oy. Renlund Ab. to Suomen Vuolukivi Oy., and was still producing in 1967.

MINERAL FUELS

Atomic Energy.—No decisions apparently were made concerning the type of reactor or source of fuel for Finland's first nuclear power project, although new bids were solicited for a reactor having output capacity of about 500 megawatts instead of 350 megawatts as previously proposed. The new tenders were reportedly extended only to the Swedish firm Allmänna Svenska Elektriska Aktirebolaget (ASEA) and the United Kingdom Atomic Energy Authority (UKAEA) but it was possible that the Soviet Union would also be invited to bid.

The Finnish Atomic Industry Group, formed in 1966 by eight large companies, was awarded a contract for core components for the nuclear reactor being built at Oskarshamn, Sweden.

Coal and Coke.—Coal and coke imports increased about 5 percent in 1967. Consumption of both fuels appeared to increase slightly as compared with the 1966 coal consumption of 1.92 million tons and coke consumption of 860,000 tons. The displacement of solid fuels by oil was most noticeable in paper and woodworking industries, railroads, and domestic heating. An agreement was signed late in 1967 with the Soviet Union for delivery of 500,000 to 700,000 tons of coal and 620,000 tons of coke in 1968.

A significant share of Finland's industrial fuel consumption still consists of waste of the forest products industries. Solids from black and sulfite liquor alone provided nearly 2 million tons of coal equivalent in 1963 and 1964 (the last years for which data are available), and accounted for more than 26 percent of industrial energy consumption in those years. Wood waste accounted for an additional 11 percent. The energy equivalent of these wastes in 1964 was equal to the consumption of liquid fuels.

Petroleum.—The large increase in crude oil imports in 1967 was due to the first full year's operation of the Neste Oy. refinery at Porvoo, which came on stream in September 1966. The combined annual throughput capacity of the Naantali and Porvoo refineries was 5 million tons in 1967 and was expected to be increased to 8.5 million tons by 1969. Most of the additional capacity will be installed in Porvoo.

The increased refinery production led to decreased imports and increased exports of petroleum products in 1967 and probably supplied domestic demand for gasoline, jet fuel, and liquefied petroleum gas. Petroleum product consumption increased by 19 percent in 1966 to 6.65 million tons, of which 54 percent was supplied by local production.

Neste Oy. concluded two contracts for crude oil supply in 1966, one for 15.2 million tons of Soviet crude oil, to be supplied from 1966 to 1970 by V/O Sojuznefte-export and the other for 5.1 million tons of Persian Gulf crude oil, to be supplied during 1967–71 by British Petroleum Trading, Ltd.

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The Mineral Industry of France

By L. Nahai [1]

The 1967 performance of major sectors of the French mineral and energy-producing industry varied; solid fuels and metal ore mining recorded declines with respect to 1966 index figures, but construction materials, petroleum, and refined products showed increases. The production index of miscellaneous minerals and metals remained almost unchanged.

The nation suffered a mild recession in early 1967, but at midyear the Government took measures to stimulate the economy. There was a slack in private consumption, which increased only 3.8 percent compared with the 4.6 percent target. For the year as a whole, the volume of French gross domestic output increased by 4.4 percent compared with a 5-percent growth target.

The value of crude mineral output in 1966, the last year for which complete data are available, was about $1,779 million.[2] This was equivalent to about 2 percent of the 1966 gross domestic product (production intérieure brut). Distribution of mineral output value by commodity groups was as follows: Energy products (including uranium), $872 million; quarry products, $534 million; metallic minerals, $197 million; and nonmetallic minerals other than quarry products, $176 million.[3] Solid fuels ranked first in value ($677 million), followed by sand and gravel ($198 million), and iron ore ($173 million). For the first time, the value of iron ore fell below that of sand and gravel.

Domestic smelter production met French requirements for principal nonferrous metals in various degrees with a surplus only in aluminum. Production of refined copper was equal to 13 percent of refined copper consumption (but direct use of scrap increases this figure to 25 to 28 percent of consumption). Slab zinc output was close to consumption (92 percent) and output of lead was equal to 88 percent of consumption.

As of December 31, 1966, personnel employed in the extractive industry, other than quarrying, totaled 220,312, a decline of 12,905 from the December 31, 1965, total. This was principally the result of reduced employment in coal and iron mines, although employment in all categories of mining except fluorspar and slate also declined. Employment on December 31, 1966, was as follows: Coal and lignite 176,097; iron ore 17,459; other metal mines 5,154; potash 10,857; crude oil, natural gas, asphaltic limestone, and bituminous schist operations 5,097; slate 3,593; and other 2,055. About 99,000 were engaged in quarrying.[4] Cement and lime plants employed about 16,000. Petroleum exploration, production, and refining accounted for 27,000.[5] Among metallurgical plants, the iron and steel industry (exclusive of foundries) employed an average of 120,560 production workers, and 40,700 salaried employees: [6] ferroalloy plants employed 3,970 and nonferrous metals plants 9,000. The total of personnel listed, 536,542, was about 2.7 percent of total French labor force.

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[1] Chief area specialist, Europe, Division of International Activities.

[2] Where necessary, values have been converted from francs (Fr.) to U.S. dollars at the rate of Fr. 1=U.S. $0.20255.

[3] Source: Ministère de l'Industrie. Bureau de Documentation Minère. Statistiques de l'Industrie Minérale 1966. Paris, France, 1968, p. 8.

[4] This figure also includes workers engaged in making asbestos cement, and concrete products.

[5] There is some duplication between this figure and the 5,097 employed in the production of crude petroleum, natural gas, asphaltic limestone, and bituminous schist.

[6] Includes salaried employees of activities associated with iron and steel industry.

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PRODUCTION

The index of overall industrial production (1959 = 100). stood at 155 compared with 152 in 1966. Indexes for petroleum and refined products and construction materials mining increased significantly, but other sectors showed only small upward changes, except for the reduction in metal ore mining. The index of building and public works increased from 157 to 162, but the number of permits for construction of dwellings declined from 509,700 in 1966 to about 457,500 in 1967.[7]

Steel production was almost the same as in 1966, while refined lead output increased 1.5 percent. Output of primary aluminum, slab zinc, and refined copper declined by 0.6, 5.3, and 9.1 percent, respectively. Output of lead and zinc in concentrates increased 7 percent, but bauxite output declined slightly. Among nonmetallic minerals, potash and talc showed increases, whereas in the energy industries, domestic crude oil production declined 3 percent, while refined products output increased 11.6 percent. Solid fuel output showed a small decline. Production of electricity increased by 5.7 percent, from 105,600 million kilowatt-hours in 1966 to 111,600 million kilowatt-hours in 1967. Thermal power accounted for 60 percent of the total.

[7] Based on data for the first three quarters.

Table 1.—France: Indexes of industrial production

(1959 = 100)

	1966 [1]	1967 [1]	Percent change 1967–66
All industrial production including construction	152	155	+1.9
All industrial production excluding construction	150	153	+2.0
Solid fuels	88	85	−3.5
Petroleum and refined products	220	244	+10.9
Electricity	164	176	+7.3
Metal ore mining	97	88	−9.3
Mining and preparation of miscellaneous minerals	122	123	+0.8
Construction material mining	169	178	+5.3
Metal production	131	131	----------
Ceramics and building material fabrication	160	170	+6.2
Chemical industry	204	221	+8.3
Building and public works	157	162	+3.1

[1] Monthly average.

Source: Ministere de l'Industrie. Bulletin Mensuel de Statistique Industrielle. Paris, France, January and April 1968.

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Table 2.—France: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Aluminum:					
Bauxite:					
For alumina, thousand tons	1,911	2,329	2,519	2,673	2,771
For other uses, do.	118	104	143	138	42
Total, do.	2,029	2,433	2,662	r 2,811	2,813
Alumina: [1]					
Hydrated	726,900	805,683	873,825	r 962,799	1,024,000
Calcined	649,543	741,139	772,928	844,897	914,000
Metal, primary	298,365	315,990	340,528	363,511	361,200
Metal, secondary	49,500	50,340	50,250	59,609	58,000
Rolled and extruded, including foil	r 164,964	r 177,582	r 177,368	r 213,165	227,000
Castings	r 81,800	r 88,440	r 88,970	r 91,970	e 92,000
Antimony:					
Content of ore	100	108	121	r 279	293
Smelter	703	639	r 790	r 834	e 600
Arsenic [2]	7,982	8,595	9,187	9,038	e 9,000
Beryllium, kilograms	6,201	14,281	NA	NA	NA
Bismuth, smelter, do.	43,400	56,065	48,260	r 69,006	61,000
Cadmium	297	492	r 428	r 448	499
Chromium	531	460	629	NA	NA
Cobalt, smelter	752	749	889	840	919
Copper:					
Mine (metal content)	274	267	283	r 434	NA
Secondary blister	r 7,100	r 7,500	11,000	r 11,000	NA
Refined:					
Electrolytic	27,200	30,700	r 31,900	r 31,400	37,061
Secondary from scrap	6,500	7,200	r 9,200	r 11,300	NA
Total	33,700	37,900	r 41,100	42,700	38,800
Gold-silver ore	150,034	149,107	148,226	134,166	136,280
Gold in ore, troy ounces	53,627	54,303	57,389	60,154	87,000
Gold (smelter), do.	54,560	53,434	r 56,199	r 68,674	NA
Iron and steel:					
Iron ore, thousand tons	57,892	60,938	59,532	55,050	49,220
Pig iron and blast furnace ferroalloys, do.	14,306	15,863	r 15,770	15,590	15,710
Of which spiegeleisen and high carbon ferromanganese, do.	368	412	432	355	320
Other ferroalloys [3]	201	218	247	r 256	NA
Steel ingots and metal for casting, thousand tons	r 17,557	r 19,780	r 19,604	19,585	19,655
Rolled steel, do.	13,198	14,619	14,793	r 14,873	14,847

See footnotes at end of table.

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Table 2.—France: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals—Continued					
Lead:					
Ore	10,626	15,595	24,971	r 36,428	37,748
Contained metal in lead and zinc concentrates	8,396	12,190	18,051	r 26,754	e 25,000
Smelter, primary	77,627	89,790	98,356	108,638	115,900
Secondary	10,202	14,475	12,392	15,829	28,100
Antimonial lead [4]	17,770	17,415	16,823	17,421	
Total refined lead	105,599	121,680	127,571	r 141,888	144,000
Magnesium	1,743	989	2,841	r 3,419	4,165
Manganese:					
Ore	1,306	1,277	1,400	1,817	NA
Metal	925	1,734	2,704	NA	NA
Nickel, metal content of pure nickel, ferronickel, and nickel oxide	9,612	7,661	r 6,418	r 12,782	12,653
Silicon	15,445	21,245	21,493	20,828	e 21,000
Silver, content of metallurgical plant final products thousand troy ounces	3,843	3,688	r 3,475	r 4,129	4,716
Tantalum kilograms	308	170	NA	NA	NA
Thorium	227	180	NA	NA	NA
Tin concentrate:					
Gross weight long tons	370	655	602	567	e 600
Metal content do	272	486	447	r 421	e 450
Titanium	19	13	NA	NA	NA
Tungsten concentrate, gross weight	------	------	------	22	NA
Uranium:					
Ore:					
Gross weight	793,829	773,800	r 827,313	750,764	704,700
Metal content	1,083	1,009	r 1,118	1,094	1,227
Concentrate (chemical):					
Gross weight	4,700	4,441	r 5,209	5,899	5,830
Metal content	1,529	1,470	r 1,580	1,647	1,640
Metal	1,205	1,843	NA	NA	NA
Zinc:					
Ore	25,781	25,205	38,638	r 43,157	44,700
Mixed concentrate (lead and zinc)	9,514	7,411			
Zinc content of zinc and lead concentrates	18,198	16,841	20,902	r 23,294	e 25,000
Smelter including secondary	169,100	190,236	192,036	r 195,991	185,700
Zinc dust	4,254	4,120	4,330	r 4,700	5,100
Remelted zinc	33,821	r 37,000	34,596	33,213	NA
Zirconium kilograms	73,300	112,000	NA	NA	NA
Nonmetals:					
Alabaster	1,300	820	1,140	1,360	NA
Asbestos	23,672	22,035	r 10,141	r 300	NA
Barite	74,460	83,821	104,084	r 99,121	95,000
Beach pebble	193,320	174,943	170,326	169,000	NA
Building stone:					
Granite and similar rocks thousand tons	896	1,034	r 1,127	984	NA

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Limestone	do	2,886	3,850	3,019	2,612	NA
Marble	do	199	245	501	515	NA
Other stones	do	124	127	123	192	NA
Crushed limestone and granite	do	2,812	4,080	3,890	3,684	NA
Cement, all types		18,134	21,537	22,365	r 23,304	24,600
Chalk and similar calcareous rocks	thousand tons	3,853	3,676	3,608	3,862	NA
Clays:						
Bentonite		19,959	17,328	15,527	14,365	NA
Brick and tile clay	thousand tons	8,555	9,993	10,530	9,960	NA
Ceramic and pottery clay		391,306	355,162	338,203	471,895	NA
Clay and marl for cement industry	thousand tons	6,678	8,370	10,045	10,356	NA
Kaolin and kaolinitic clay		271,792	287,475	295,392	435,444	NA
Refractory clay	thousand tons	912	1,057	1,034	712	NA
Diatomaceous earth		132,725	133,083	r 150,635	r 141,258	NA
Dolomite:						
For agriculture		106,177	92,495	130,540	117,485	NA
Crude for calcining		476,386	611,552	668,930	747,706	NA
Other		367,518	416,150	500,867	520,366	NA
Feldspar and pegmatites		173,504	196,361	r 221,141	r 222,162	NA
Fluorspar		145,428	195,153	195,565	r 215,435	NA
Fly ash	thousand tons	-------	4,583	4,022	3,779	NA
Gypsum:						
For agriculture		11,073	8,134	7,510	8,839	NA
Plaster and cement	thousand tons	4,107	4,790	4,872	5,119	NA
Anhydrite		95,637	113,974	132,986	144,394	NA
Lava		10,029	13,388	9,786	10,794	NA
Lime:						
Hydraulic	thousand tons	739	791	831	r 855	NA
High-grade (fat lime)	do	2,648	2,917	2,825	r 2,910	2,730
Limestone:						
For agriculture	do	724	749	702	642	NA
For iron and steel industry	do	4,317	5,071	5,105	4,835	NA
For lime and cement	do	19,227	21,339	22,367	23,122	NA
For sugar mills	do	639	735	672	483	NA
Total	do	24,907	27,894	28,846	29,082	NA
Marl		215,775	217,272	224,654	176,664	NA
Mica		173	293	195	223	NA
Millstones and grindstones		1,267	1,113	1,202	1,548	NA
Mine fill	thousand tons	10,212	12,719	12,665	12,379	NA
Ochre and mineral pigments		4,747	5,265	4,513	3,145	NA
Phosphatic chalk		50,423	43,109	34,590	36,420	24,400
Potash:						
Gross weight of mine run ore	thousand tons	11,058	11,406	11,832	11,537	11,694
K_2O equivalent	do	1,722	1,807	1,879	1,910	1,937
Pumice		770	916	708	r 806	NA
Pozzolana and lapilli		545,661	585,631	709,543	671,650	NA
Pyrite		252,310	191,341	134,361	r 88,076	85,000
Quartz		262,429	302,165	315,683	438,082	NA
Road building foundation and ballast materials (other than sand and gravel):						
Ballast	thouand tons	45,965	52,279	57,793	63,475	NA
Foundation material	do	3,224	5,329	4,675	7,155	NA

See footnotes at end of table.

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Table 2.—France: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1963	1964	1965	1966	1967 p
Nonmetals—Continued						
Road building foundation and ballast materials (other than sand and gravel):—Continued						
Paving block and curbing	do	152	230	139	139	NA
Ground rock for road fillers	do	306	87	151	557	NA
Total	do	49,647	57,925	62,758	71,326	NA
Salt	do	3,694	4,032	4,449	4,462	NA
Sand and gravel (alluvial only):						
By dredging	do	53,527	61,918	66,999	73,483	NA
By other winning methods	do	35,196	48,490	54,353	59,059	NA
Total	do	88,723	110,408	121,352	r 132,542	e 138,000
Sand, industrial:						
Glass	do	1,211	1,438	1,613	r 1,411	NA
Foundry	do	1,741	1,692	1,697	r 1,635	NA
Miscellaneous	do	282	451	452	584	NA
Total	do	3,234	3,581	3,762	3,630	e 3,400
Slate:						
Roof		119,046	121,319	121,211	122,583	121,000
Other		47,156	45,700	56,763	51,461	45
Sulfur	thousand tons	1,409	1,511	1,521	r 1,540	1,645
Talc		158,121	205,400	240,288	r 224,076	225,000
Mineral fuels:						
Bituminous and asphaltic material		109,225	107,608	117,000	131,249	135,000
Bituminous and anthracite coal	thousand tons	47,762	53,042	51,348	50,338	47,625
Lignite	do	2,471	2,244	2,690	2,564	2,931
Peat	do	35	50	47	r 58	NA
Coke oven coke (including low temperature, oven coke and breeze)	do	13,735	14,303	13,650	13,200	12,630
Gas coke	do	138	61	20	r 14	9
Coal briquets	do	8,014	6,638	5,806	r 5,050	4,839
Natural gas [5] (gross production)	million cubic feet	265,494	280,362	279,338	279,055	302,010
(marketed product)	do	171,664	179,751	178,268	182,258	196,313
Petroleum:						
Crude	thousand tons	2,522	2,845	2,988	r 2,925	2,832
Refinery products [6]	do	44,094	50,376	57,596	63,139	70,443
Carbon black		76,200	85,960	99,800	120,250	120,000

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Hydrated and calcined alumina are successive stages of alumina production and are not to be added.

[2] Arsenic content of final products.

[3] Ferromolybdenum, ferrotungsten, and ferrovanadium data are for contained metal.

[4] Lead content.

[5] Natural gas reported in cubic meters has been converted to cubic feet at 60° F (15.56° C) and 14.7 pounds per square inch (760 millimeters of mercury) by multiplying cubic meters by 35.3145.

[6] Gross refinery output.

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TRADE

Mineral commodity trade as a part of total French commodity trade is shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	1,989	10,048	19.8
1966	2,064	10,886	19.0
1967	2,039	11,383	17.9
Imports:			
1965	3,091	10,336	29.9
1966	3,456	11,840	29.2
1967	3,478	12,406	28.0
Trade balance:			
1965	−1,102	−288	XX
1966	−1,392	−954	XX
1967	−1,439	−1,028	XX

Iron and steel (including scrap), petroleum and petroleum products, and nonferrous minerals and metals (including semimanufactures) were the most important export items in the mineral field accounting for about 9.1, 2.6, and 2.9 percent, respectively, of all French exports.

Mineral fuels remained dominant among mineral imports accounting for 51 percent of the value of the tabulated mineral and metal imports and 14.4 percent of all imports.

The other countries of the European Economic Community (EEC)[8] and the countries of the European Free Trade Association (EFTA)[9] remained France's most important trading partners. In 1967, 41.3 percent of all exports of France were to other EEC countries and 15.8 percent to EFTA countries. The corresponding import figures were 43.5 and 11.5 percent.

In 1966, for the minerals and metals tabulated in table 3, on a value basis, France's exports to other EEC nations were 50 percent of the total; those to the EFTA countries were 18 percent. For the same commodities, imports from the EEC countries were 41 percent of the total; those from the EFTA countries were 11 percent. French exports to the United States were valued at $138 million and imports $120 million. In 1966, the United States was an important market for French iron and steel ($88 million), aluminum and semimanufacturers ($19 million), and copper semimanufactures ($9 million). France's principal imports from the United States in 1966 were nonferrous metals (particularly silver, copper, and aluminum) valued at $82 million, coal ($32 million), petroleum products ($11 million), and nonferrous ores and scrap ($7 million).

[8] The EEC includes Belgium, France, Italy, Luxembourg, the Netherlands, and West Germany.

[9] The EFTA includes Austria, Denmark, Finland (associated member), Norway, Portugal, Sweden, Switzerland, and the United Kingdom.

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Table 3.—France: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	Total export		1966 destinations	
	1965	1966	EEC [1]	Principal destinations
Metals:				
Aluminum:				
Oxide and hydroxide [2]	131,730	158,088	9,401	Switzerland 64,815; United States 39,519; Spain 26,299.
Bauxite	201,784	280,173	127,418	West Germany 121,606; Greece 82,829; United Kingdom 61,018.
Metallurgical residues	2,981	4,619	4,519	Italy 3,221.
Metal, including alloys:				
Scrap	12,377	15,244	14,950	Italy 10,746; West Germany 3,684.
Ingots	182,699	171,043	130,735	Belgium-Luxembourg 100,070; West Germany 17,035; United States 16,776.
Semimanufactures	42,596	58,144	26,922	United States 12,717; West Germany 9,080; Belgium-Luxembourg 8,864.
Antimony: Metal, including scrap	74	61	20	NA.
Arsenic (anhydride)	10,373	10,889	1,274	United States 4,388; Japan 1,850.
Beryllium	6	5	---	United States 4.
Bismuth	59	71	---	All to United Kingdom.
Cadmium	104	46	28	Netherlands 15.
Chromium:				
Oxide and hydroxide	750	1,054	249	Sweden 225; Netherlands 137; Denmark 135.
Ore	403	211	204	West Germany 204.
Metal	340	332	63	United States 182.
Cobalt	649	605	81	United States 453.
Columbium value, thousands	$1	$1.2	$.6	NA.
Copper:				
Metallurgical residues	7,505	3,990	3,990	Belgium-Luxembourg 2,182; West Germany 1,808.
Matte	1,663	692	692	Netherlands 443; West Germany 107.
Metal and alloys:				
Blister and other unrefined	18,634	15,900	15,713	Belgium-Luxembourg 11,675; West Germany 4,038.
Scrap	41,199	39,532	36,505	West Germany 15,334; Belgium-Luxembourg 10,432; Italy 10,278.
Refined	10,583	15,607	12,327	West Germany 5,613; Netherlands 3,791.
Semimanufactures	34,352	31,379	13,752	United States 7,478; West Germany 6,429; Netherlands 5,092.
Gallium [3] value, thousands	$170	$170	$4	Switzerland $160.
Germanium	7	4	4	All to Belgium-Luxembourg.
Gold: [4]				
Metal, including alloys troy ounces	16,847	47,454	33,211	Netherlands 15,111; Belgium-Luxembourg 14,918.
Ashes and sweepings do.	3,890	1,382	---	Martinque 868.
Other metal (temporary imports and exports) do.	51,409	103,429	48,290	Switzerland 48,290; United States 36,619.
Iron and steel:				
Iron ore thousand tons	20,747	18,195	18,131	Belgium-Luxembourg 13,373; West Germany 4,758.
Pyrite cinder do.	243	303	303	West Germany 263; Belgium-Luxembourg 40.
Slag, dust, scale, etc do.	1,193	1,146	1,104	West Germany 1,041.
Scrap do.	1,832	1,823	1,821	Italy 1,712.
Pig iron, [5] including spiegeleisen do.	130	83	76	West Germany 45; Belgium-Luxembourg 18; Italy 11.
Ferroalloys do.	256	254	154	United States 65; West Germany 61; Italy 43; Belgium-Luxembourg 43.
Ingots and other primary forms do.	787	910	538	Italy 231; Belgium-Luxembourg 174; Spain 140; West Germany 131.

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Semimanufactures:					
Bars, rods, sections [6]	do	2,372	2,369	969	West Germany 605; United States 422; Belgium-Luxembourg 185.
Universals, plate, sheet	do	2,426	2,157	991	West Germany 706; United States 174; Italy 172.
Hoop and strip	do	223	225	133	West Germany 71; Italy 46; Switzerland 28.
Rails and accessories	do	140	90	39	Italy 30; Cameroon 12; Netherlands 6; Switzerland 6.
Wire	do	111	99	15	West Germany 9; Algeria 7.
Tubes, pipes, fittings	do	601	572	113	Netherlands 64; United States 62; Algeria 28.
Castings and forgings, rough	do	4	4	1	West Germany 1.
Lead:					
Ore		3,178	1,637	1,482	Belgium-Luxembourg 1,482.
Metallurgical residues		5,799	5,351	5,317	Belgium-Luxembourg 4,993.
Oxides		5,628	7,171	2,857	Netherlands 1,966; Czechoslovakia 1,303.
Metal including alloys:					
Scrap		12,132	2,276	2,189	Italy 1,852.
Pig, including alloys		14,926	9,225	4,523	Switzerland 3,258; Netherlands 2,303; West Germany 1,911.
Semimanufactures, including alloys		1,160	1,012	168	Norway 138; Syria 102.
Magnesium, all forms		21	80	7	Greece 40; Sweden 22.
Manganese:					
Ore		1,591	763	424	Spain 230; Italy 199.
Oxide		221	213	135	West Germany 135.
Metal, all forms		1,590	3,443	1,535	United States 1,440.
Mercury	76-pound flasks	203	203	116	West Germany 87.
Molybdenum:					
Ore		15	27	9	Sweden 18.
Oxide		60	71	26	United States 26.
Metal, all forms		11	9	6	West Germany 4.
Nickel:					
Matte, speiss, etc		56	22	16	Italy 11.
Metallurgical residues		854	754	365	Italy 276; United States 256.
Oxide and hydroxide		380	395	323	Belgium-Luxembourg 234.
Metal including alloys:					
Scrap		1,378	1,591	1,148	West Germany 508; United Kingdom 413.
Ingots		4,808	7,149	1,900	Mainland China 4,837; West Germany 718.
Semimanufactures, including anodes		1,773	1,961	976	Netherlands 367; West Germany 338; Spain 307.
Platinum and platinum-group: [4]					
Metal, including alloys	troy ounces	73,947	93,591	45,365	Netherlands 31,347; Spain 22,859.
Ashes and sweepings	do	96	96	----------	NA.
Selenium		1	1	1	NA.
Silver: [4]					
Metal, including alloys	thousand troy ounces	6,186	6,131	2,735	Netherlands 1,167; Sweden 917; Italy 903.
Ashes and sweepings	do	122	290	131	Finland 16.
Sodium metal		1,905	2,624	2,528	Italy 2,528.
Tantalum (powder)		2	2	1	United States 1; Netherlands 1.
Tin:					
Ore	long tons	642	560	----------	Spain 555.
Oxide	do	54	49	48	All to West Germany.
Metal including alloys:					
Scrap	do	26	46	46	West Germany 31.
Ingots	do	231	227	11	Switzerland 53; Algeria 37; United Kingdom 34.
Semimanufactures	do	83	40	9	Belgium-Luxembourg 8.
Titanium:					
Dioxide		10,725	5,867	1,003	United States 2,438.
Metal, all forms		48	36	29	Netherlands 24.

See footnotes at end of table.

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Table 3.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	Total export		1966 destinations	
	1965	1966	EEC [1]	Principal destinations
Metals—Continued				
Tungsten:				
Ore	5	3	3	NA.
Trioxide	122	112	20	Austria 92.
Metal, all forms	206	267	75	United Kingdom 132; West Germany 46.
Uranium and other radioactive materials:				
Ore	2,888	2,496	2,496	All to West Germany.
Metal, including thorium—kilograms	1,300	NA	----	
Other radioactive material—metric tons	333	473	173	Italy 61; United Kingdom 55; Netherlands 38; United States 38.
Zinc:				
Ore	505	237	237	All to Belgium-Luxembourg.
Matte, ashes, residues	14,230	----	----	
Dust (blue powder)	1,292	1,397	35	Norway 1,300.
Oxide	4,720	7,578	2,677	Mainland China 1,530; Belgium-Luxembourg 1,516.
Metal including alloys:				
Scrap	764	1,511	1,511	Italy 1,423.
Slab and ingot	18,022	20,428	7,519	Italy 5,975; United States 3,035.
Semimanufactures	3,041	2,489	1,642	West Germany 1,641.
Zirconium:				
Ore	177	283	229	West Germany 204.
Oxide	58	82	40	Spain 32; Italy 30.
Metal, including nuclear grade	38	155	16	United States 68.
Other metals [7]	65	179	31	Spain 89; West Germany 24.
Other metallic ores, ashes, residues	28,605	31,330	18,710	Belgium-Luxembourg 15,165; Sweden 11,791.
Other slag and ash	114,553	145,906	139,795	West Germany 68,026.
Nonmetals:				
Abrasives, natural, n.e.s.	381	398	380	West Germany 225.
Asbestos, crude	5,013	1,928	413	Algeria 1,036; Tunisia 285.
Asbestos-cement products	34,277	51,577	32,026	West Germany 29,751; United Kingdom 5,389.
Barite, including witherite	14,046	12,900	5,914	Belgium-Luxembourg 3,023; Nigeria 2,939; Italy 2,293.
Borates, natural	1,212	2,119	1,618	Netherlands 980; West Germany 618.
Bromine	1,101	1,096	21	Switzerland 658; United Kingdom 417.
Cement—thousand tons	717	854	329	West Germany 245; Spain 135; Cameroon 59.
Chalk	269,803	293,091	253,384	West Germany 118,759; Belgium-Luxembourg 75,464; Netherlands 38,917.
Clays and clay products:				
Crude:				
Kaolin	56,109	55,946	49,743	West Germany 40,055.
Bentonite	2,429	3,777	276	Nigeria 1,584.
Refractory	343,201	332,532	301,903	Italy 162,386; Belgium-Luxemboug 49,058.
Other	26,714	52,892	44,558	West Germany 15,894; Italy 15,831.
Clay and refractory construction materials (bricks, tile, etc.)	194,642	174,001	103,381	West Germany 56,955; Belgium-Luxembourg 35,570.
Corundum:				
Natural, including emery	50	72	21	NA.
Artificial	10,172	13,858	8,379	Italy 3,342; West Germany 2,958; Belgium-Luxembourg 1,785.

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Cryolite and chiolite, natural	556	11	10	NA.
Diamond:				
Industrial, excluding powder—value, thousands	$1,383	$1,366	$913	West Germany $637; Spain $184; Netherlands $182.
Gem, unset—do	$3,843	$4,859	$1,435	United States $2,135; Switzerland $919.
Dust and powder—do	$112	$174	$150	Belgium-Luxembourg $112.
Diatomite	16,564	19,787	17,654	West Germany 15,049.
Dolomite, including calcined	24,674	29,010	16,812	West Germany 8,429; Belgium-Luxembourg 7,974; Switzerland 3,854.
Earth pigments, including iron oxide	8,376	3,763	1,151	United Kingdom 367; Algeria 323.
Earths, other (pozzolan, santorin, etc.)	2,139	1,735	677	NA.
Feldspar	25,338	23,467	18,434	Belgium-Luxembourg 9,131; West Germany 8,991.
Fertilizer materials:				
Crude:				
Nitrogenous (natural sodium nitrate)	487	---	---	
Phosphate rock	14,606	2,060	840	Switzerland 853.
Potassic salts	92,151	70,624	67,124	Belgium-Luxembourg 36,784; Netherlands 30,320.
Organic	32,602	36,454	12,106	Switzerland 15,716; Spain 5,281; Belgium-Luxembourg 3,614.
Manufactured:				
Ammonia, anhydrous—thousand tons	23	35	3	United Kingdom 16.
Nitrogenous—do	645	720	86	Mainland China 191; Cuba 74; Belgium-Luxembourg 68.
Phosphatic:				
Basic slag—do	337	343	34	Austria 167; Switzerland 124.
Other—do	47	45	11	Spain 9; Switzerland 6; Turkey 6; Italy 6.
Potassic—do	1,187	1,110	413	Belgium-Luxembourg 258; United Kingdom 159; United States 104.
Flint (pebbles)	80,792	78,753	33,919	United Kingdom 21,788; West Germany 12,999; Belgium-Luxembourg 12,860; United States 12,843.
Fluorspar	86,332	88,397	72,365	West Germany 53,530; Italy 12,265.
Graphite	1,900	1,788	780	United Kingdom 416; West Germany 390.
Gypsum and anhydrite, including plaster	786,572	807,405	505,314	Belgium-Luxembourg 411,345; Sweden 150,967; Nigeria 53,741.
Lime	194,110	240,391	196,326	West Germany 113,123; Belgium-Luxembourg 83,119.
Limestone, for flux, cement, etc	179,593	155,290	110,931	Belgium-Luxembourg 100,004; Switzerland 43,848.
Magnesite, including calcined	534	229	---	NA.
Mica	577	731	525	West Germany 443.
Precious and semiprecious stones [8]—value, thousands	$8,660	$9,769	$1,312	Switzerland $4,649; United States $2,034.
Pumice	33	142	47	NA.
Pyrite	30	---	---	
Quartz and quartizite	1,874	599	---	
Salt	94,071	117,675	102,100	Belgium-Luxembourg 77,037; West Germany 15,621.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	114,804	159,178	16,687	Guinea 54,563; Belgium-Luxembourg 9,752.
Caustic potash	10,562	9,592	3,198	Netherlands 2,772; United Kingdom 1,115.
Slate, rough and finished	17,089	18,250	17,208	Netherlands 8,179; Belgium-Luxembourg 7,196.
Stone, sand and gravel: [9]				
Building stone:				
Unfinished	120,494	106,465	96,778	Belgium-Luxembourg 72,367; West Germany 17,712.
Finished	6,014	5,897	4,371	West Germany 2,862; Belgium–Luxembourg 1,156.
Gravel and other crushed stone—thousand tons	5,839	7,428	6,472	West Germany 5,455.
Sand—do	1,451	1,778	1,351	West Germany 760; Switzerland 400; Belgium-Luxembourg 357.
Sulfur, elemental—do	925	893	214	United Kingdom 317; Netherlands 107; West Germany 90.
Talc and steatite	51,182	44,114	16,172	West Germany 9,105; United Kingdom 8,651; Switzerland 5,861.
Other mineral substances	146,413	119,674	20,003	Switzerland 99,423.
Mineral fuels:				
Asphalt and bitumen, natural	19,230	23,982	---	United Kingdom 20,596.
Asphalt, worked	5,660	5,920	2,685	West Germany 1,720; Italy 549.

See footnotes at end of table.

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Table 3.—France: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	Total export		1966 destinations	
	1965	1966	EEC [1]	Principal destinations
Nonmetals—Continued				
Carbon black	41,421	46,431	14,920	Spain 14,669.
Coal	842,581	697,637	618,192	West Germany 356,448; Netherlands 140,842; Belgium-Luxembourg 100,330.
Coal briquets	40,868	20,556	12,655	Italy 12,594; Switzerland 6,194.
Coke	57,152	109,929	61,172	Belgium-Luxembourg 30,055; West Germany 13,473; Algeria 11,210.
Gas:				
Natural, including liquid petroleum gas (propane, butane, and other liquid petroleum gases).	392,147	427,260	63,246	Spain 184,819; Portugal 94,082; United Kingdom 63,010.
Manufactured	196	2,777	2,777	All to Belgium-Luxembourg.
Lignite, including briquets	61,174	77,334	---------	Spain 76,862.
Peat, including briquets	488	442	422	NA.
Petroleum refinery products:				
Gasoline thousand tons	1,889	2,105	708	United Kingdom 607; Switzerland 566; West Germany 518.
Kerosine do	490	395	67	Switzerland 180; United Kingdom 51; Netherlands 39.
Distillate fuel oil do	3,472	4,340	2,539	West Germany 1,789; Switzerland 1,155; Netherlands 634.
Residual fuel oil do	3,137	4,945	2,265	West Germany 1,282; United Kingdom 1,254; Belgium-Luxembourg 624; Switzerland 358.
Lubricants do	244	275	100	Belgium-Luxembourg 43; United Kingdom 33; Netherlands 29; Algeria 28.
Other do	349	448	210	West Germany 162; Switzerland 126; Belgium-Luxembourg 38.
Total refined products do	9,581	12,508	5,889	West Germany 3,791; Switzerland 2,393; United Kingdom 2,179; Netherlands 1,145.
Chemical derivatives of coal, petroleum, or gas	76,886	92,679	55,296	Belgium-Luxembourg 18,172; West Germany 18,056; Netherlands 15,235; United States 12,815.

NA Not available.
[1] Belgium, West Germany, Italy, Luxembourg, and the Netherlands.
[2] Excludes artificial corundum.
[3] Including indium and thallium.
[4] Calculated from quantities reported in kilograms.
[5] Including cast iron and shot, grit, powder, and sponge of iron or steel.
[6] Including wire rod.
[7] Alkali, alkaline earth, and rare earth metals except sodium.
[8] Including synthetic and reconstituted stone but not including diamond.
[9] Not including slate, flint, or industrial limestone.

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Table 4.—France: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	Total imports		1966 sources	
	1965	1966	EEC [1]	Principal destinations
Metals:				
Aluminum:				
Bauxite	116,508	153,557	322	Greece 87,854; British Guiana 44,237; Surinam 17,531.
Oxide and hydroxide [2]	19,700	20,530	866	Guinea 10,300; United States 9,296.
Metallurgical residues	11,615	9,372	9,182	West Germany 8,042.
Metal including alloys:				
Scrap	2,165	7,121	4,736	Belgium-Luxembourg 3,521; United Kingdom 1,017.
Ingots	71,694	87,268	9,287	Cameroon 25,439; United States 19,936; Greece 11,675.
Semimanufactures	19,425	30,426	25,885	West Germany 13,281; Belgium-Luxembourg 9,652.
Antimony:				
Ore and concentrate	1,678	1,522	1	Morocco 1,061; Republic of South Africa 376.
Metal, all forms	1,737	2,443	272	Mainland China 2,128.
Arsenic, including anhydride	144	39	8	Sweden 30.
Beryllium:				
Ore	NA	408	---	All from Australia.
Metal, all forms, value, thousands	$180	$385	---	United States $371.
Bismuth	700	749	175	Peru 169; Japan 141; United Kingdom 113.
Cadmium	408	549	169	Japan 145; Belgium-Luxembourg 99; Congo (Kinshasa) 72.
Cobalt:				
Ore	11,672	12,124	---	Morocco 12,071.
Oxide and hydroxide	131	136	132	Belgium-Luxembourg 126.
Metal, all forms	313	437	332	Belgium-Luxembourg 297.
Chromium:				
Ore	224,287	237,364	207	U.S.S.R. 103,505; Turkey 61,880; Iran 39,733.
Oxide and hydroxide	1,870	1,870	1,379	West Germany 1,379; United Kingdom 435.
Metal	14	4	3	NA.
Columbium:				
Ore (including tantalum ore)	138	429	---	Canada 423.
Metal, all forms, value, thousands	$128	NA	NA	
Copper:				
Metallurgical residues	112	494	365	Italy 205; Switzerland 110.
Matte	297	1,555	506	Peru 529; Zambia 467.
Metal including alloys:				
Scrap	11,855	18,719	13,066	West Germany 8,364; Belgium-Luxembourg 3,603.
Blister and other unrefined	6,290	6,886	234	Congo (Kinshasa) 6,401.
Refined	262,019	303,420	128,663	Belgium-Luxembourg 107,163; Zambia 52,883; United States 33,183; Congo (Kinshasa) 25,673; Chile 25,429.
Semimanufactures	15,767	21,054	15,704	West Germany 5,902; Belgium-Luxembourg 5,790; Italy 2,417.
Germanium, gallium, etc. [3]	3	3	2	Belgium-Luxembourg 1; Netherlands 1.
Gold: [4]				
Ashes and sweepings, troy ounces	345,331	87,643	73,497	West Germany 56,007.
Metal, including alloys, do	37,005	44,497	35,141	West Germany 24,113.
Metal, other (temporary imports and reexports), do	110,566	210,619	43,146	Switzerland 92,287; United Kingdom 76,197.

See footnotes at end of table.

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Table 4.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		Total imports		1966 sources	
		1965	1966	EEC [1]	Principal destinations
Metals—Continued					
Iron and steel:					
Iron ore	thousand tons	3,909	4,245	73	Mauritania 1,422; Liberia 946; Brazil 716; Sweden 396.
Roasted iron pyrites	do	77	59	50	West Germany 32; Italy 17.
Slag, dust, scale, etc	do	708	764	757	West Germany 468; Belgium-Luxembourg 280.
Scrap	do	494	511	460	Belgium-Luxembourg 315; West Germany 118.
Pig iron, spiegelesen, etc [5]	do	124	159	97	West Germany 42; Finland 38 Belgium-Luxembourg 36.
Ferroalloys	do	46	49	17	Caledonia 29; Belgium-Luxembourg 11.
Ingots and other primary forms	do	943	1,061	1,057	Belgium-Luxembourg 510; West Germany 501.
Semimanufactures:					
Bars, rods, sections [6]	do	1,174	1,304	1,269	West Germany 754; Belgium-Luxembourg 423.
Universals, plates, sheets	do	1,287	1,476	1,385	Belgium-Luxembourg 670; West Germany 514.
Hoop and strip	do	247	275	275	Belgium-Luxembourg 160; West Germany 106.
Rails and accessories	do	38	35	12	United Kingdom 22; Belgium-Luxembourg 9.
Wire	do	51	65	60	West Germany 42; Belgium-Luxembourg 16.
Tubes, pipes, fittings	do	137	187	155	West Germany 90; Belgium-Luxembourg 31; Italy 27.
Rough castings and forgings		1,709	2,587	2,106	West Germany 1,405; Belgium-Luxembourg 629; Morocco 49; Australia 33.
Lead:					
Ore		130,387	121,017	146	Ireland 12,391.
Metallurgical residues		3,347	753	23	Morocco 690.
Oxides		2,327	1,506	1,229	Belgium-Luxembourg 741; West Germany 473.
Metals including alloys:					
Scrap		2,950	4,150	2,461	Belgium-Luxembourg 1,687; Algeria 1,244; West Germany 774.
Pig		28,170	35,399	11,441	Morocco 15,341; Belgium-Luxembourg 7,211; West Germany 3,927.
Semimanufactures		484	696	628	Belgium-Luxembourg 386; West Germany 176.
Magnesium including alloys:					
Scrap		6	95	89	Italy 89.
Ingots		1,196	951	420	Italy 420; United Kingdom 226.
Semimanufactures		207	219	34	United Kingdom 92; Canada 39; United States 33.
Manganese:					
Ore		854,728	842,082	673	South Africa 312,517; Morocco 201,694; Gabon 183,316.
Oxide		1,339	2,159	1,135	Belgium-Luxembourg 1,012; Japan 994.
Metal, all forms		725	556	---	Republic of South Africa 501.
Mercury	76-pound flasks	12,938	8,410	2,755	Italy 2,610; Spain 2,378; Mexico 1,798.
Molybdenum:					
Ore		4,171	5,665	177	United States 2,374; Canada 1,659; Peru 972.
Oxide		4	NA	---	
Metal, all forms		88	86	60	West Germany 49; Austria 24.
Nickel:					
Metallurgical residues		11	26	26	NA.
Matte		16,823	13,172	---	New Calendonia 6,997; Cuba 4,848.
Oxide and hydroxide		80	33	5	Canada 23.
Metal including alloys:					
Scrap		484	588	184	United States 174; West Germany 134; Switzerland 75.

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Ingots	8,259	8,559	251	Canada 4,120; United Kingdom 3,526.
Semimanufactures	2,120	2,651	751	United Kingdom 972; West Germany 676; United States 534.
Platinum and platinum-group: [4]				
Metal, troy ounces	176,989	161,461	38,581	Czechoslovakia 48,162; United Kingdom 30,640; West Germany 26,267.
Ashes and sweepings, do	22,377	17,522	14,725	Netherlands 12,539.
Selenium	28	42	11	Sweden 16; United States 13.
Silver: [4]				
Metal, all forms, thousand troy ounces	24,515	29,756	3,306	United States 12,747; United Kingdom 5,184; Lebanon 3,793.
Ashes and sweepings, do	972	503	490	Netherlands 449.
Tantalum, all forms	9	12	7	United States 4; West Germany 4.
Tin:				
Oxide, long tons	8	47	47	West Germany 35.
Metal including alloys:				
Scrap, do	40	38	---	Switzerland 34.
Ingots, do	10,042	10,544	3,450	Malaysia 3,569; Netherlands 2,056.
Semimanufactures, do	115	42	10	United Kingdom 26.
Titanium:				
Ore	94,919	110,516	---	Australia 70,360; Malaysia 23,265; Spain 16,488.
Dioxide	14,721	17,307	13,169	West Germany 8,311; United Kingdom 3,289.
Metal, all forms	297	337	117	Japan 120; West Germany 109.
Tungsten:				
Ore	2,188	2,468	10	South Korea 1,014; mainland China 988.
Trioxide	67	57	57	West Germany 52.
Metal, all forms	67	74	54	West Germany 39; Netherlands 14.
Uranium and thorium:				
Uranium ore	2,239	1,741	---	Gabon 1,340; Malagasy Republic 401.
Thorium ore	1,404	1,398	---	Malagasy Republic 992; Australia 406.
Metal, including alloys, kilograms	500	NA	NA	
Other radioactive materials, do	157,000	267,000	39,000	United States 117,000; Brazil 36,000.
Vanadium pentoxide	611	784	416	West Germany 416; Finland 250.
Zinc:				
Ore	332,225	348,258	23,174	Canada 75,799; Morocco 73,657; Peru 39,069; Sweden 34,798.
Matte, ashes, residues	6,957	6,957	5,600	West Germany 2,885; Belgium-Luxembourg 2,088 Netherlands 627.
Dust (blue powder)	4,038	4,224	3,995	Belgium-Luxembourg 3,972.
Oxide	1,754	1,252	947	West Germany 552; Italy 263.
Metal including alloys:				
Scrap	17,209	18,728	17,945	Netherlands 10,287; Belgium-Luxembourg 6,207.
Slab and ingot (including alloys)	14,546	24,594	15,665	Belgium-Luxembourg 13,606; Norway 2,565.
Semimanufactures (including alloys)	2,928	3,814	3,315	Belgium-Luxembourg 2,326.
Zirconium:				
Ore	29,820	27,882	40	Australia 27,581.
Oxide	293	578	27	United States 463.
Metal	102	13	---	NA.
Other metals [7], value, thousands	$226	NA	NA	
Other metallic ores	2,897	NA	NA	
Other metalliferous ash, slag, and residues	73,417	94,172	94,170	Belgium-Luxembourg 61,872; West Germany 31,318.
Nonmetals:				
Abrasives, natural, n.e.s	2,169	2,725	2,349	Italy 2,305.
Asbestos	106,665	124,442	9,069	Canada 71,139; U.S.S.R. 32,602.
Asbestos-cement products	31,602	57,972	51,168	Belgium-Luxembourg 21,999; Italy 20,075.
Barite, including witherite	74,442	82,938	62,510	West Germany 62,374; Morocco 12,210.
Borates (natural)	67,301	73,181	124	Turkey 41,876; United States 31,818.
Boric oxide and acid	421	827	605	Italy 579; United States 221.

See footnotes at end of table.

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Table 4.—France: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	Total imports		1966 sources	
	1965	1966	EEC [1]	Principal destinations
Nonmetals—Continued				
Bromine	NA	6	-------	NA.
Cement	94,090	87,842	24,511	Switzerland 62,713; Italy 14,499.
Chalk	12,775	8,813	8,747	Belgium-Luxembourg 8,685.
Clay and clay products:				
Crude:				
Kaolin, including calcined	209,601	239,852	10,667	United Kingdom 205,804; United States 15,880; West Germany 10,529.
Bentonite	114,127	112,769	20,816	Greece 48,391; Italy 20,512; Morocco 18,157.
Refractory clays	169,693	171,206	152,405	West Germany 133, 659.
Other clays and aluminum silicates	26,074	32,227	15,087	United Kingdom 8,679; West Germany 7,480; Belgium-Luxembourg 6,392.
Clay and refractory construction materials (bricks, etc)	367,117	377,153	321,032	West Germany 168,240; Italy 78,960; Belgium-Luxembourg 71,496.
Corundum:				
Natural, including emery	4,935	1,118	490	Greece 577; Netherlands 443.
Artifical	1,569	2,396	1,503	West Germany 1,456; United States 577.
Cryolite and chiolite, natural	1,380	1,984	-------	All from Denmark.
Diamond:				
Industrial, except dust ----- value, thousands	$4,004	$5,075	$2,004	Ireland $1,981; Belgium-Luxembourg $1,077.
Gem, unset ----- do	$15,593	$20,654	$10,849	Belgium-Luxembourg $9,162; Israel $3,838.
Dust and powder ----- do	$3,014	$3,608	$1,131	United States $1,235; United Kingdom $1,068.
Diatomite	7,987	9,132	2,588	United States 3,305; Algeria 2,588; West Germany 1,208; Italy 1,140.
Dolomite, including calcined	178,233	183,323	174,961	Belgium-Luxembourg 157,855; West Germany 17,105.
Earth pigments, including iron oxide	13,410	15,491	13,194	West Germany 13,002.
Earths, other (pozzolanic, santorin, etc)	103	332	80	United States 100.
Feldspar	15,940	15,523	7,326	West Germany 6,567; Norway 3,833; Portugal 1,989.
Fertilizer materials:				
Crude:				
Nitrogenous (natural sodium nitrate)	40,760	29,782	-------	All from Chile.
Phosphate rock ----- thousand tons	2,870	2,939	10	Morocco 1,724; Tunisia 612; Togo 321.
Potassic salts, crude	-------	NA		
Manufactured:				
Ammonia, anhydrous	42,428	52,471	52,437	Belgium-Luxembourg 48,157.
Nitrogenous	128,156	151,516	131,895	Belgium-Luxembourg 112,830; Switzerland 17,465.
Potassic	72,788	62,017	42,849	Belgium-Luxembourg 27,385; Spain 19,158.
Phosphatic:				
Basic slag	736,856	682,725	682,725	Belgium-Luxembourg 557,786; West Germany 124,939.
Other	356,219	300,844	251,101	Belgium-Luxembourg 125,810; Netherlands 124,749.
Flint (pebbles)	23,127	101,080	7,726	United Kingdom 30,176.
Fluorspar	329	3,109	2,142	Italy 1,239; United Kingdom 967; West Germany 903.
Graphite	5,007	4,879	1,610	Malagasy Republic 2,698; Italy 1,013.
Gypsum and plaster	22,107	23,095	22,494	West Germany 18,452.
Iodine, crude	400	-------	-------	
Lime	77,833	99,756	98,506	Belgium-Luxembourg 76,184; West Germany 22,302.

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Limestone for flux, cement, etc.	188,748	159,631	159,631	Belgium-Luxembourg 153,591.
Lithium and strontium minerals	NA	4,742	4,656	Netherlands 4,656.
Magnesite, including calcined	42,962	42,154	3,821	Austria 17,285; United Kingdom 3,785; Greece 3,754.
Mica	4,808	7,548	---	India 5,362; Norway 1,263.
Precious and semiprecious stones, value, thousands	$6,869	$8,120	$434	India $4,459.
Pumice	36,679	37,599	33,508	Italy 27,880.
Pyrite	350,977	338,984	136	Cyprus 141,488; Spain 133,482; U.S.S.R. 35,976.
Quartz and quartzite	17,447	21,667	20,286	Italy 10,842; Belgium-Luxembourg 7,707.
Salt	117,733	58,060	21,336	Algeria 36,200; Netherlands 11,284.
Caustic soda	26,908	31,597	31,442	Italy 21,846; Belgium-Luxembourg 6,781.
Caustic potash and peroxides of potassium or sodium	177	109	41	Sweden 55; West Germany 21.
Slate, rough and finished	13,553	21,585	10,506	Italy 8,571; United Kingdom 4,655; Spain 4,536.
Stone, sand and gravel: [9]				
Dimension stone:				
Unfinished	121,562	155,885	71,558	Italy 66,079; Republic of South Africa 38,963.
Finished	74,087	75,022	62,090	Italy 59,503; Portugal 11,647.
Gravel and other crushed stone, thousand tons	2,016	2,531	2,418	Belgium-Luxembourg 2,306.
Sand, do.	1,333	1,408	1,394	Netherlands 728; Belgium-Luxembourg 613.
Sulfur, elemental, all grades	264,236	226,461	337	Mexico 135,966; United States 86,724.
Talc and steatite	6,892	7,670	3,925	Italy 3,548; Austria 1,255; Norway 1,154; United States 1,087.
Other mineral substances	313,538	525,349	38,368	Switzerland 461,368.
Mineral fuels:				
Asphalt and bitumen, natural	2,169	3,100	1,091	United States 1,488; Trinidad 319.
Asphalt, worked	863	2,253	1,188	West Germany 760; Canada 430.
Coal, thousand tons	11,929	11,092	6,450	West Germany 5,542; United States 1,776; U.S.S.R. 1,491.
Coal briquets, do.	415	333	333	Netherlands 199; Belgium-Luxembourg 81; West Germany 53.
Carbon black	39,063	39,654	19,435	United States 17,356; Netherlands 13,009; West Germany, 5,084.
Coke, thousand tons	4,462	3,734	3,734	West Germany 2,757; Netherlands 762.
Gas:				
Natural, including liquid petroleum gases	65,853	402,332	83,446	Algeria 303,810; West Germany 32,126.
Manufactured	123,004	118,815	116,853	West Germany 79,353; Belgium-Luxembourg 37,499.
Hydrogen and rare gases	67	517	472	West Germany 249; Italy 161.
Lignite and briquets, thousand tons	384	368	368	West Germany 359.
Peat, including briquets, do.	19	27	23	West Germany 16; Netherlands 7.
Petroleum:				
Crude, do.	58,556	62,752	---	Algeria 18,492; Iraq 10,401; Kuwait 8,357; Libya 7,280; Iran 4,169.
Refined products:				
Gasoline, do.	502	589	236	Italy 177; Rumania 111; U.S.S.R. 92; Netherlands Antilles 59.
Kerosine, including white spirit, do.	19	31	15	United Kingdom 14; Belgium-Luxembourg 11.
Distillate fuel oil, do.	1,720	2,440	1,177	Italy 988; Rumania 627; U.S.S.R. 480.
Residual fuel oil, do.	1,100	1,117	464	U.S.S.R. 380; Italy 369; Rumania 215.
Lubricants, do.	33	51	37	Italy 18; Netherlands 13; United States 12.
Other, do.	531	505	210	West Germany 172; United States 147; U.S.S.R. 52; United Kingdom 47.
Mineral tar and crude chemicals derived from coal, petroloum, or gas.	209,384	282,719	109,514	United States 97,253; United Kingdom 34,967; Belgium-Luxembourg 33,696; West Germany 32,212.

NA Not available.
[1] Belgium, West Germany, Italy, Luxembourg, and the Netherlands.
[2] Excludes artificial corundum.
[3] Includes gallium, germanian, indium, thallium, rhenium.
[4] Calculated from quantities reported in kilograms.
[5] Includes cast iron and sponge, powder, etc., of iron and steel.
[6] Including wire rod.
[7] Alkali, alkaline earth, and rare-earth metals including cerium and hafnium.
[8] Including synthetic and reconstituted stone but not including diamond.
[9] Excludes slate, flint, and industrial limestone.

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Table 5.—France: Summary of mineral commodity trade in 1967

(Thousand metric tons and thousand dollars)

Commodity	Imports		Exports	
	Quantity	Value	Quantity	Value
Metals:				
Iron and steel:				
Iron ore, including pyrite cinder	4,889	$4,811	17,764	$56,431
Scrap	465	1,691	2,191	80,185
Pig iron, ferroalloys, sponge iron, powder, shot and grit	246	3,758	332	53,186
Primary steel forms and iron and steel semimanufactures	5,114	680,147	6,563	898,618
Other:				
Ores	1,796	122,771	165	4,511
Scrap and other metal-bearing waste	70	19,678	146	60,511
Metal oxides for paint and other uses	43	20	275	29
Metals including semimanufactures:				
Precious, except gold	1	45,787	(1)	12,884
Mercury, metaloids, alkali, alkaline earth and rare	1	6,780	14	5,301
Other base	517	496,448	313	241,930
Total [2]	13,142	1,381,891	27,764	1,413,586
Nonmetals:				
Abrasives, natural, including industrial diamond	50	9,921	18	2,708
Cement, lime, worked dimension stone and other building materials	412	26,597	1,232	27,702
Fertilizer materials:				
Crude	3,140	48,867	105	1,641
Manufactured, including Thomas slag	1,848	63,768	3,037	104,035
Stone, sand and gravel, except worked dimension stone	5,468	24,900	11,808	21,791
Other	2,823	133,499	2,974	119,734
Total	13,741	307,552	19,174	277,611
Mineral fuels and related commodities:				
Carbon black	49	10,618	44	8,977
Coal, lignite, coke, peat and briquets thereof	15,482	294,664	925	16,296
Gas, natural and manufactured	746	21,083	494	16,633
Petroleum:				
Crude	72,348	1,306,489	(1)	(1)
Products	4,921	143,276	12,035	299,901
Crude chemicals distilled from coal, petroleum, and/or natural gas	310	12,834	102	6,072
Total [2]	93,856	1,788,964	13,600	347,879
Grand total	120,739	3,478,407	60,538	2,039,076

[1] Less than ½ unit.
[2] Details do not add to totals because of rounding.

Source: Statistical office of the United Nations.

COMMODITY REVIEW

METALS

Bauxite and Aluminum.— Aluminum production and consumption in France increased about 11 and 20 percent, respectively, in 1966, but remained almost static in 1967. Nonetheless, aluminum consumption for conductors increased 25 percent in 1967. The aluminum semifabrication industry was reorganized around Pechiney, the largest aluminum producer, and led to the formation of Groupe Pechiney [10] with an annual capacity of 500,000 tons of aluminum semimanufactures. Conditions for the merger of Pechiney and Trefimétaux were completed in October. The The Compagnie Générale du Duralumin et du Cuivre (Cégédur) became a holding company as of July 1 and its industrial operations were transferred to Groupe Pechiney. The latter opened its central research institute at Voreppe/Isère near Grenoble and the new cold rolling mill of its subsidiary, Rhenalu, in Neu-Breisach started operation. This plant has an initial capacity of 2,000 tons monthly which

[10] Excluding Pechiney's chemical and non-EEC interests.

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will be increased ultimately to 4,000 tons monthly by 1975. In the next 2 years, a foundry with eight furnaces will be added. Eventually the plant will include a second cold-rolling finishing line for producing strips. The alumina capacity of the Pechiney's Gardanne plant was increased to 1,500 tons per day.

Aluminum trade in 1967 was as follows:

Form	(Metric tons)	
	Imports	Exports
Ingots:		
Not alloyed	92,828	103,808
Alloyed	6,046	36,474
Total	98,874	140,282
Semimanufactures	25,952	65,156

The Republic of Cameroon was the largest source of aluminum ingots(43,083 tons) followed by Greece(22,517). Exports were principally to Belgium (41,183 tons), mainland China (23,854), and a number of other European countries. Import sources for semimanufactures were principally Belgium, West Germany, and Canada and export destinations were West Germany, the United States and many other European and non-European countries.

Copper.—Primary refined copper consumption was 278,500 tons, 4.4 percent less than in 1966 and the lowest figure since 1964. Substitution of aluminum and plastics in the major use areas contributed to the 1967 decline. About 45 percent of the consumption was in heavy electric equipment production, about 20 percent in construction and housing, and about 6 percent in automotive and agricultural machinery manufacture.[11] Direct use of scrap in 1966 amounted to 115,900 tons of copper content.

Copper imports in 1967, valued at $313 million, comprised 1,209 tons of matte, 11,493 tons of scrap, 11,609 tons of blister, 236,936 tons of refined copper, and 23,640 tons of semimanufactures. Copper imports, excluding semimanufactures, were 20 percent lower than in 1966, mainly as a result of smaller refined copper imports. French copper exports, aside from 223 tons of matte and 43,460 tons of scrap, totaled 56,043 tons distributed as follows: Blister 12,453, refined 13,999, semifinished 29,500, and alloys 91.

Production of semifinished copper and copper alloys (wire, rods and sections, plates, sheets and strips, and tubes) totaled 384,000 tons.

Iron Ore.—As a result of a strike in early 1967, production of iron ore declined 10.6 percent almost entirely in the Lorraine mines. However, demands were fully met through withdrawals from stocks. The average grade of ore, 31.5 percent, was moderately higher than in 1966 (31.0 percent). In the Lorraine area, production per manshift (surface and underground) increased to 21 tons from 18.9 tons in 1966.

On the basis of a 24-million-ton steel production target for 1970, the eastern iron ore mines could produce 60 million tons of ore with reasonable marketing prospects. To maintain the region's com-

[11] Metals Week. Feb. 20, 1967, p. 13.

Table 6.—France: Marketable iron ore production by basin, and total iron ore shipments, and stocks

(Thousand metric tons)

	1963	1964	1965	1966	1967
Production:					
Lorraine	54,377	57,455	56,125	51,684	46,000
West (Normandy and Anjou)	3,412	3,400	3,326	3,308	3,200
Pyrenees	75	65	80	58	40
Other basins	28	18			
Total	57,892	60,938	[1] 59,532	55,050	[1] 49,220
Iron content	17,399	18,440	18,098	17,114	15,651
Shipments:					
Domestic	36,374	38,689	38,145	36,335	34,499
Other EEC countries	21,341	21,882	20,672	18,375	17,223
Other destinations	267	227	88	63	83
Total	57,982	60,798	58,905	54,773	51,805
Stocks	7,711	7,700	8,238	8,300	6,100

NA Not available.
[1] Detail does not add to totals shown because of independent rounding.

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petitive position, mines in this area have plans to invest $105 million in mining and $28 million to $53 million in beneficiation facilities.

Iron and Steel.—*Production.*—In 1967, French pig iron and crude steel production, 15,710,000 tons and 19,655,000 tons, respectively, rose only fractionally over the 1966 level. Crude steel capacity rose from 23.4 to 23.9 million tons. Special steels constituted about 9.5 percent of total crude steel production and oxygen steel (3,295,000 tons) was 16.8 percent of all steel output. France's share of world steel output declined to 4 percent from 4.2 percent in 1965, but France maintained her rank as the sixth largest world steel producer.

A number of production trends reported previously continued during 1967. These included the increase in the share of hematite-pig iron obtained from high-grade imported ore, the increase in proportion of sintered iron ore used, and the increase in oxygen steel output (in tonnage as well as in share of total steel output). There was no significant change in the geographical pattern of pig iron output (11,075,390 tons in the East and 3,728,179 in the North), but steel output in the North increased by 216,971 tons to 5,464,564 tons, while output in the East declined by 166,055 tons to 12,085,612 tons. Of 83 blast furnaces in operation, 62 were in the East, 16 in the North, three in the Southwest, and two in the West steel areas of France.

The share of flat products in rolled steel output, 49.9 percent, remained almost identical as in 1966.

Although production of individual flat products varied, the total of flat products and the hot-rolled and cold-rolled components thereof remained practically the

Table 7.—France: Salient iron and steel industry statistics

(Thousand metric tons unless otherwise specified)

	1963	1964	1965	1966	1967
SINTER					
Production	14,478	17,442	18,531	19,436	21,065
Raw material consumption:					
Iron ore	17,135	20,780	22,454	23,484	25,433
Furnace dusts	1,446	1,476	1,241	1,273	1,007
Manganese	39	48	64	54	30
Pyrite cinder	58	58	34	38	26
Other iron-bearing materials	r 408	r 549	r 591	580	677
Limestone	415	404	552	587	702
PIG IRON					
Number of blast furnaces:					
Available	143	138	133	127	124
In operation at yearend	97	98	94	84	83
Maximum production capacity	17,300	18,100	18,770	19,100	19,650
Production:					
Thomas [1]	12,069	13,042	12,559	12,245	12,085
Hematite and semihematite (steelmaking)	782	1,300	1,680	1,983	2,359
Phosphorus (foundry)	447	452	416	282	207
Hematite and semihematite (foundry)	444	450	r 509	552	625
Special pig iron (foundry)	196	205	174	174	115
Spiegeleisen and high-carbon ferromanganese	368	412	432	355	320
Total [2]	14,306	15,863	15,770	15,590	15,710
Raw material consumption for pig iron production:					
Iron ore directly in blast furnaces	21,860	21,246	19,398	16,968	14,092
Iron ore sinter	14,335	17,328	18,337	19,340	21,064
Manganese ore:					
In blast furnaces	569	630	677	605	562
In sintering plants	38	48	70	55	30
Metallurgical rejects	1,120	1,175	r 1,068	1,182	931
Scrap	833	690	478	433	426
Limestone	430	312	293	270	231
Phosphatic limestone	2	1	1	2	1
Coke in blast furnaces	12,116	12,785	r 12,325	11,584	10,931

See footnotes at end of table.

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Table 7.—France: Salient iron and steel industry statistics—Continued

(Metric tons unless otherwise specified)

	1963	1964	1965	1966	1967
STEEL					
Number of furnaces in operation:					
Thomas converters	99	95	94	92	89
Open hearth	60	62	54	53	52
Electric	108	109	109	112	112
Oxygen	8	8	9	10	9
Maximum production capacity (all furnaces)	20,900	21,900	22,500	23,400	23,900
Production of crude steel:					
Thomas	9,833	10,604	10,397	10,301	10,112
Open hearth	4,774	5,182	4,775	4,483	4,284
Electric	1,526	1,675	1,774	1,863	1,905
Bessemer	81	93	88	67	67
Kaldo, LD, and similar	1,341	2,224	2,568	2,871	3,287
Creuset	2	2	2	1	--
Total	17,557	19,780	19,604	19,585	19,655
Ingots	17,211	19,413	19,237	19,247	19,307
Liquid steel for casting	346	367	367	338	346
Material consumption for steel:					
Pig iron, spiegeleisen, and ferroalloy	13,080	14,703	14,633	14,611	14,796
Scrap	6,204	7,012	6,884	6,909	6,826
Liquid Thomas steel	265	193	173	147	129
Lime	1,746	1,933	1,892	1,890	1,831
Limestone	64	60	51	47	110
Iron ore	151	188	210	213	207
Fluorspar	33	37	32	33	33
Consumption per ton of crude steel:					
Pig iron kilograms	739	737	740	739	740
Scrap do	359	359	364	366	364
Rolled steel production:					
Rails and accessories	337	353	364	259	283
Heavy structural	848	1,030	1,122	1,121	1,143
Wire rods	1,870	2,010	2,085	2,153	2,106
Bars	3,067	3,327	3,480	3,297	3,333
Pipe skelp	529	602	609	601	558
Other	30	37	31	22	18
Flat products:					
Wide plates	81	79	94	94	96
Hot rolled sheets:					
Thickness, 4.76 millimeters or more	936	1,199	1,160	1,206	1,354
Thickness, 3 to 4.76 millimeters	516	501	500	512	514
Thickness, less than 3 millimeters	641	742	r 726	731	600
Cold rolled sheets: Thickness, less than 3 millimeters	3,282	3,647	3,579	3,794	3,825
Hot-rolled strips for tubes	1,061	1,092	1,043	1,084	1,017
Subtotal flat products [2]	6,517	7,260	7,101	7,419	7,406
Total rolled steel production [2]	13,198	14,619	14,793	14,873	14,847
Galvanized and other plated sheets	408	506	447	493	522
Condenser sheets	178	207	188	187	178
Tinplate	591	625	543	659	691
Total consumption of iron and steel industry:					
Iron ore	39,141	42,214	42,062	40,664	39,732
Scrap [3]	7,037	7,701	7,362	7,342	7,253
Coke	13,522	14,327	13,778	12,835	12,145
Coal other than coking coal	1,605	1,412	1,608	1,750	1,935
Coking coal	5,674	5,712	5,627	5,530	5,502
Fuel oil	1,063	1,233	1,234	1,273	1,392
Thomas slag production	2,351	2,573	2,546	2,560	2,517
Average total employment (workers and staff)	130,591	130,806	127,593	120,560	114,102

r Revised.
[1] Includes special pig iron in metric tons as follows: 1963, 6,137; 1964, 42,994; 1965, 3,749; 1966, 2,729.
[2] Detail does not add to total because of rounding.
[3] Excludes scrap used by rolling mills in tons as follows: 1963, 77,866; 1964, 85,858; 1965, 98,284; 1966, 93,813 1967, 108,080.

same. There were small increases in production of rails, heavy structurals, and bars but other categories of nonflat products declined.

Consumption.—In terms of crude steel, apparent consumption (without regard to stock changes) increased 4.9 percent to 18,376,000 from 17,531,000 tons in 1966,

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but real consumption reportedly increased by only 3 percent. Consumption was influenced by the relatively small increase in general economic activity, the decrease in private consumption, and the high activity in industries producing capital goods. Motor vehicle production was about the same as in 1966. Steel shipments to the domestic market were almost exactly the same as in 1966; increased consumption was met by imports. Domestic shipments in 1966 totaled 10,556,000 tons distributed as follows, in thousand tons: For conversion 2,694; to steel merchants 2,833; to manufacturing industries 2,864; to railroads, extractive industries, and building industry 1,166; others 173; and alloy steels 826.[12]

Trade.—France exported 5,918,000 tons of steel ingots, primary forms, and semimanufactures and 644,900 tons of pipes and tubes; corresponding import figures were 4,870,000 tons and 244,850 tons. The net export of 1,048,000 tons for steel (excluding pipes and tubes) was less than in 1966 because of reduced shipments to West Germany. Imports accounted for 28 percent of domestic consumption against 22 percent in 1966. Trade in pig iron and similar products comprised 332,000 tons of exports and 246,000 tons of imports.

Other EEC countries were the largest markets and sources of steel. Imports of steel from these countries (4,655,782 tons) exceeded exports to them by 1,425,000 tons.

Facilities and Investments.—At the end of 1966, 44 companies produced steel in 58 plants. There were an additional 52 plants having no steelmaking capacity. Of the 58 steel-producing plants, two had annual capacity of 2 to 3 million tons, two of 1.5 to 2 million tons, five of 1 to 1.5 million tons, eight of 0.5 to 1 million ton, and the remaining 41, of less than 0.5 million tons each of annual capacity. The industry's investment in 1966 totaled about $136 million; the corresponding 1967 expenditure was about $186 million.

The French steel industry started its Plan Professionel de la Sidérurgie (Professional Plan for the Steel Industry) which envisages restructuring of the industry and rationalization in production. An agreement signed by the Government with Union Sidérurgique du Nord et de l'Est de la France (Usinor), Société des Aciéries de Lorraine (Sacilor), and Société Lorraine de Laminage Continue (Sollac) provides $607 million out of the total $911 million which under the plan will be made available by the Government to the industry at low interest rates. The sum loaned to these companies will be used for the purchase of equipment.

Since 1961, there have been five mergers between French steel companies. In 1966, Lorraine-Escaut and Usinor and their respective holding companies, Aciéries de Longwy and Denain Nord-Est, merged. The two holding companies formed a new company Denain-Nord-Est Longwy. The merged Usinor/Lorraine-Escaut, called Usinor, has 7 million tons of annual production capacity.

In December 1967, DeWendel et Cie, Sidélor, and Société Mosellane de Sidérurgie merged all mining and steel activities into Wendel-Sidélor which will have a capacity to produce 20 million tons of iron ore and 7.8 million tons of steel annually. The new firm will also take over both firms' interests in Sollac and the new steel plant at Gandrange being erected by Sacilor, a joint subsidiary of De Wendel and Sidélor. This merger requires approval by the European Economic Community. De Wendel-Sidélor will emphasize expansion of the Gandrange complex and close marginal installations.

Early in 1967, a continuous merchant bar plant was put in service at Gandrange. Oxygen steelmarking facilities, a blooming mill stand, and a continuous billet stand will also be added. This plant will have a 1.6 million tons crude steel capacity.

In December 1967, The J. J. Carnaud et Forges de Basse-Indre put a second electrolytic tinplating plant into operation with an annual capacity of 138,000 tons which can be increased to 214,000 tons per year by adding further plating tanks. The company's other plant at Laon has a 130,000-ton annual capacity. The new plant is France's fifth electrolytic tinplating line, the others being operated by Sollac.[13]

France's tinplate consumption is estimated to have exceeded 450,000 tons and exports totaled 354,515 tons valued at $156 million.

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[12] Organization for Economic Cooperation and Development. The Iron and Steel Industry in 1966 and Trends in 1967. Paris, France, 1967, table 26.

[13] Tin International. May 1968, p. 110.

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Lead and Zinc.—Refined lead and slab zinc consumption in 1967 totaled about 164,000 tons and 202,000 tons, respectively. Lead consumption was 5.3 percent less than in 1966, but zinc consumption was 4,000 tons more than in 1966.

Trade in lead in 1967 was as follows:

Form	Metric tons	
	Imports	Exports
Ore and concentrate	128,456	3,895
Scrap	4,515	9,615
Pig lead	39,605	18,021
Semimanufactures	748	895

Value of listed imports and exports totaled $28.3 million and $7.4 million, respectively. Imports of all categories exceeded 1966 levels; pig lead exports were nearly twice as much as in 1966, presumably because of higher domestic smelter output.

Zinc production declined 5 percent from the 1966 level, but was scheduled to reach 230,000 to 240,000 tons by 1970 when consumption is expected to reach 385,000 to 410,000 tons. With about 80,000 tons output in the Viviez and Creil plants, Vieille Montagne remained the leading zinc producer, followed by Compagnie Asturienne des Mines at Auby (about 70,000 tons) and Peñarroya at Noyelles-Godault (35,000 tons). The Noyelles-Godault plant will attain an annual production capacity of 80,000 tons of zinc and 120,000 tons of lead in 1968. Peñarroya also produced 90 tons of cadmium and 4,800,000 ounces of silver.

French trade in zinc in 1967 was as follows:

Form	Metric tons	
	Imports	Exports
Ore	332,140	219
Scrap	15,107	2,228
Zinc dust	4,154	1,479
Slab	34,047	12,129
Semimanufactures	4,947	2,051

While ore and scrap imports declined from 1966 levels, slab and semimanufacture imports increased. The value of the listed imports and exports totaled $49 million and $5.2 million, respectively.

Peñarroya, Europe's largest lead producer, took over **Société Francaise des** Métaux et Alliages Blanc (MAB), one of France's leading consumers of heavy metal scrap [14] and merged with Minerais et Métaux, a marketing organization. MAB produces annually 60,000 tons of lead, zinc, aluminum, and copper from scrap in six plants.

Nickel.—There was a slight reduction in nickel output from the Havre refinery. A new company, Société Auxiliaire Minière du Pacifique, was formed in the latter part of 1967 to explore and exploit New Caledonian nickel deposits. Sixty percent of the new company's capital is held by French institutions and banks and 40 percent by International Nickel Company of Canada, Ltd. French organizations participating in the new company are Bureau de Recherches Géologiques et Minières, Banque National de Paris, Ugine-Kuhlman, Compagnie de Mokta, and Compagnie Financière de Suez et de l'Union Parisienne among others.

Tin.—Tin consumption in 1967 was estimated at 10,350 long tons (10,100 tons primary and 250 tons secondary) distributed approximately as follows in percent: Tinplating 56.7 white metal alloys 28.0, copper alloys 7.6, chemical products 4.1, semimanufactures 2.6, and miscellaneous 1.0.[15] Consumption in 1967 was about 250 tons less than in 1966 because of reduced use for producing bronzes, some white alloys, and antifriction metals. France imported 10,149 long tons of tin, 68 tons of tin alloys, 31 tons of tin scrap, and 38 tons of tin semimanufactures. Exports comprised 50 tons of tin, 104 tons of tin alloys, 18 tons of scrap, and 54 tons of semimanufactures.

Work continued on tin occurrences discovered in 1965 near Morbihan in Brittany. Vein deposits of the Cornish type were indicated.

Tungsten.—Work carried out by Bureau de Recherches Géologiques et Minière (BRGM), in association with Omnimines and Compagnie Métallurgique et Minière, on the tungsten occurrence at Salu (Ariège) has shown a minable deposit

[14] Société Minière et Métallurgique de Peñarroya. Paris, France, Exercise, 1967, p. 19.
[15] Dieppedalle & Sealles. Statistique Etain 1967. Paris, France, Apr. 10, 1968, 4 p.

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which will be equipped for exploitation. BRGM discovered the deposit in 1965.

Uranium.—Frances's reasonably assured and estimated additional uranium resources are estimated at about 59,000 tons for the price range below $10 per pound.

France signed an agreement with Nigeria for the exploration of the Arlit deposit which is estimated to contain 20,000 tons of uranium. France guaranteed to take the entire output of the deposit for 30 years and was expected to pay a delivered price of $8 per pound for the oxide. Compagnie Française des Minerais d'Uranium (in which Peñarroya has an important share) has 20 percent of the capital of Société des Mines de l'Air which will exploit the deposit. An annual output of 1,000 tons of uranium is expected by 1973.

The Dong Trieu mining company discovered a uranium deposit at Saint-Suplice (Haute Vienne) which is considered promising.

NONMETALS

The value of nonmetals production (excluding building raw materials and quarry products) in 1966, the latest year for which data are available, totaled $176 million. Potash, sulfur, and salt were the most important commodities and accounted for 53, 28, and 15 percent, respectively, of the total. Building raw material and quarry product output was valued at an additional $534 million of which $479 million was accounted for by material used in the building industry and the remainder by other industry and agriculture.

The value of nonmetal imports and exports, including cement and lime, in 1967 totaled $308 million and $278 million, respectively. Among imports, phosphates ($48 million), asbestos ($19 million), clay including refractory ($14 million), building stones ($12 million), and sand and gravel ($7 million) were the most important items. Sulfur, potash in chemically treated forms, and cement exports were valued at $42 million, $40 million, and $17 million, respectively. Next in importance were sand and gravel and crushed rock ($9 million) and clays ($8.5 million).

Cement and Lime.—Production of cement by types in recent years has been as follows:

Type	Thousand metric tons				
	1962	1963	1964	1965	1966
Portland	11,757	12,647	16,227	16,844	18,031
Slag:					
Blast furnace	2,203	2,485	2,333	2,400	2,341
Other	626	1,448	1,144	1,239	1,211
Special	1,475	749	983	1,050	1,001
Total	16,061	17,329	20,687	[1] 21,534	22,584
Natural	397	275	255	213	81
Mortar	424	530	595	619	638
Grand total	16,882	18,134	21,537	[1] 22,365	[1] 23,304

[1] Details do not add to total shown because of independent rounding.

At yearend 1967, France had an annual cement production capacity of 31.2 million tons, 2.7 million tons more than at yearend 1966. This increase was achieved by the addition of six new kilns of which three were in three new plants with 880,000 tons total annual capacity and three with 710,000 tons annual capacity in existing plants. Plant improvements accounted for an additional 1,100,000 tons of annual capacity.

Apparent consumption totaled 23,920,000 (22,598,000 tons in 1966) and per capita consumption 480 kilograms.

Feldspar.—Société des Feldspaths du Midi (Perpigan) and Compagnie des Feldspaths S.A. (Bayonne) merged into Société Française des Feldspaths S.A. The latter now has three feldspar plants and will attempt to find export markets.[16]

[16] Mines et Métallurgie. (Paris, France), No. 3, January 1968, p. 6.

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Fertilizer Materials.—Principal developments have been changes in the structure of the industry. The State-owned Mines Dominales de Potasse d'Alsace and the nitrogen production agency Office National Industriel de l'Azote (ONIA) were merged in 1967 into l'Enterprise Minière et Chimique. The new company has three subsidiaries that will be concerned with potash mining, chemical fertilizer production, and sales. The new company will have an annual turnover of about $220 million and will employ 16,000 in the two mining and fertilizer subsidiaries. ONIA produced 297,000 tons of ammonia in 1966.

On December 29, 1966, Société des Produits Azotes merged with Société d' Electro-Chimie d'Electro-Metallurgie et des Acièries Electriques d'Ugine (Ugine). On the same date, the latter company itself was merged with Establissements Kuhlman forming Ugine-Kuhlman. Ugine-Kuhlman had a net turnover of $565 million in 1966 ($635 million with tax). Chemicals accounted for 55.2 percent of the net turnover; special steels, nonferrous metals, ferroalloys, and other products accounted for the remainder. The new firm will produce 25 percent of France's sulfuric acid, 17 percent of its ammonia, and 20 percent of its aluminum.

Wintershall A.G., the largest potash producer in West Germany, and Mines Dominale de Potasse d'Alsace signed an agreement creating a new joint subsidiary, Produits et Engrais Chimiques de Rhin (PEC-Rhin). This firm will build a nitrogenous and compound fertilizer plant, due for completion in 1969, at Ottmarsheim near Mulhouse in the Haut-Rhin area of France. The plant will have facilities to produce 600 tons of ammonia and 900 tons of nitric acid per day as well as 300,000 tons of compound fertilizers and 100,000 tons of ammonium nitrate per year. The total cost of the project is estimated at $60 million.

L'Ammoniac Sarro-Lorraine, a joint subsidiary of Charbonnages de France (Houillères du Bassin de Lorraine) of France, and Saarbergwerke of West Germany, will build a 1,000-ton-per-day ammonia plant at Carling in the Moselle area of France. Naphtha for ammonia production will be supplied by the Saar refinery in which Charbonnage de France and Saarbergwerke participate.

Another ammonia plant of similar capacity will be built by Société Normande de l'Azote (SNA) near the petroleum refinery of Compagnie Française de Raffinage at Le Havre. The latter company, ONIA, and Pierrefitte Company participate in SNA. The plant is planned to start in 1968.

Permission for the erection of another 1,000-ton-per-day ammonia plant to be built near the Ile-de-France refinery at Grandpuits was granted in October. The plant is scheduled to come into operation in 1969.

On the production side, there was little change in potash output. Production data on other fertilizer materials follows:

Commodity	Output (metric tons)
Nitrogenous:	
Ammonia (nitrogen content)	1,453,100
Fertilizer (nitrogen content)	1,303,900
Phosphatic:	
Superphosphate	1,424,400
Ground phosphates	717,600
High phosphorus	561,600
Phosphatic slag (crude)	2,583,600
Compound	564,000

Fluorspar.—Discovery of a fluorspar deposit in the northern rim of the Morvan massif by Pechiney geologists has been reported. The deposit has an estimated 3 million ton reserves averaging 35 percent calcium fluoride.

MINERAL FUELS

Total energy consumption in 1967 increased 5.6 percent compared with that of 1966, with the increase supplied principally by petroleum products.

Coal.—*Production.*—Production of coal (anthracite and bituminous) declined 5.4 percent below the 1966 level. All fields showed a decline, but the 1,848,000-ton decline in production by Nord/Pas-de-Calais alone accounted for 68 percent of the total falloff. The Lorraine field increased its share of national output to 31.6 percent (30.7 in 1966). Nord/Pas-de-Calais remained the largest producing area with 49.2 percent of total output. The Fifth Plan (1966–70) revised the coal (excluding lignite) production target of 48 million tons to 46.5 million tons in 1969–70.

Coal production by extraction method in 1967 (corresponding 1966 figures in

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parentheses) was as follows, in percent: pickhammer only 17.0 (20.7), mechanical cutter with use of explosives and pickhammer 21.7 (21.5), explosives alone 25.3 (24.5), pickhammer and explosives 9.2 (9.8), blasting by compressed air 1.4 (2.3), plough and plough scraper 23.7 (20.6), and other 1.7 (0.6). Thus, there has been an increased extraction by ploughs and slight increase in mechanical cutter-loaders and decline in extraction by pickhammers. The number of coal ploughs in service increased from 231 in 1966 to 242, but the number of pickhammers declined from 15,770 to 14,550 and of longwall coal cutters from 85 to 52. Other coal cutting equipment in service (rotary drills, cutter-leaders, etc.) did not change much. Very few ploughs are used in the Lorraine field. This mining method has its greatest development in the Nord/Pas-de-Calais field.

Mechanized mines produced 65.7 percent of net coal mined underground in October 1967 (65.7 percent in 1966), while semimechanized mines contributed 17.1 percent (20.1 percent in 1966). At the face, nearly 80 percent of the coal output was conveyed by scraper conveyors and 9 percent by gravity. There was an average of 640 coal faces in operation in 1967 with an average length of 142 meters. Average daily production per face was 276 tons. Consumption of electricity per ton of coal produced, excluding that for ventilation, further increased to 6.80 kilowatt-hours (6.50 in 1966).

Of 67 coal mines in operation in 1966, three mines had an average daily production of 8,000 tons and over, 11 produced 4,000 to 8,000 tons per day, 39 produced 1,000 to 4,000 tons, and the remainder less than 1,000 tons per day.

In 1967, 88.0 percent of run of mine production was washed. The products consisted of 43.7 percent delivered marketable coal, 35.3 percent rejects, 6.5 percent middling, and 2.5 percent slime. Of the total coal washed, 54.4 percent was treated in heavy media, 35.5 percent in piston jigs, 9.2 percent in flotation cells, 0.6 percent on pneumatic tables, and 0.3 percent by miscellaneous facilities. There were some 50 washing plants in operation.

Consumption and Trade—Apparent consumption of coal and lignite declined; domestic output decreased by 2.7 million tons and 1.2 million tons of the coal output was added to stocks, while coal imports increased only 72,000 tons and lignite output advanced by only 367,000 tons. Shipments of domestic and imported coal for making coke totaled 16.3 million tons and those to electricity producers were 18.3 million tons. Household and small industries received 7.5 million tons of coal and, presumably the bulk of the briquets produced from 4.6 million tons of domestic and imported coal.

Coal imports (including anthracite) have shown little variation in the last 3 years, averaging about 11,700,000 tons per year. In 1967, principal suppliers were West Germany (5,794,000 tons) United States (2,154,600), U.S.S.R. (1,467,000 mainly anthracite), Poland (651,000), and United Kingdom (566,000). Average c.i.f. value per ton was $15.18 for bituminous and $25.82 for anthracite.

Coke and Coal Chemicals.—Coke ovens of Charbonnage de France accounted for 64 percent of total coke output. Coke shipments, domestic and imported, totaled 14,846,000 tons, of which 3,235,000 tons was imported coke. Shipments to the iron and steel industry accounted for 81 percent and to other industries, 12 percent; the remainder was shipped to domestic and small industrial consumers.

Charbonnage de France continued to expand its chemical activities, establishing, as of January 1, 1968, the Société Chimique des Charbonnages to take over its entire chemical production and sales activities. The new company will own and operate the 30 chemical plants that had a 1966 turnover of about $260 million. Three subsidiaries, CdF Chimie, le Comptoir français de l'Azote, and Engrais de France, will market the products. CdF Chimie's 1967 turnover totaled about $50 million; sales included coal tars and chemicals, nonaromatic organics, methane, and polyesters.

At the end of the Fifth Development Plan, the Société Chimique will turn out 2,600 tons of ammonia daily and increase its output of polyethelene, styrene, and acrylic products.[17] The company has a 600-ton-per-day ammonia plant at Mazingarbe and in 1967 obtained permission to build a 1,000-ton-per-day ammonia plant at Grandpuits, scheduled for operation in 1969.

[17] Colliery Guardian. Mar. 24, 1967, p. 320.

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Table 8.—France: Energy consumption by sources

Type of fuel	1963	1964	1965	1966	1967
Quantity:					
Solid fuel					
million tons of standard coal equivalent	r 75.2	75.2	68.9	63.7	63.9
Petroleum products do	57.0	r 66.4	73.4	79.5	90.8
Gas do	7.8	8.3	8.4	8.8	9.5
Hydroelectric power do	17.8	15.0	19.2	22.4	20.0
Total do	157.8	r 164.9	169.9	174.4	184.2
Share of total:					
Solid fuel percent	r 47.6	45.6	40.5	36.5	34.7
Petroleum produces do	r 36.2	r 40.3	43.2	45.6	49.3
Gas do	4.9	5.0	5.0	5.0	5.1
Hydroelectric power do	11.3	r 9.1	11.3	12.9	10.9
Total do	100.0	100.0	100.0	100.0	100.0

r Revised.

Source: Comité Professional du Pétrole. Éléments Statistiques, Activité l'Industrie Pétroliére 1967. Paris France, V. 1, 1967, p. A. 12.

Table 9.—France: Salient statistics of the coal and lignite industry

(Thousand metric tons unless otherwise specified)

	1963	1964	1965	1966	1967
COAL					
Production:					
Anthracite	3,053	3,373	3,621	3,541	2,880
Semianthractie	7,869	8,912	8,798	9,140	9,152
Bituminous:					
Low volatile [1]	5,249	5,247	4,378	4,034	3,715
Medium-volatile [2]	12,392	13,317	12,941	13,140	12,415
High-volatile [3]	16,686	19,117	18,465	17,527	16,561
High-volatile [4]	2,504	3,064	3,115	2,955	2,901
Total [5]	47,762	53,042	51,348	50,338	47,625
Apparent consumption (including lignite) thousand tons of standard coal equivalent	77,100	74,400	69,100	64,200	e 63,700
Stocks at yearend	6,123	5,703	7,402	10,476	11,723
Number of operating mines	NA	77	r 70	67	e 63
Average number of days worked	256	278	r 274	275	260
Average daily output metric tons	186,500	190,400	r 187,000	183,400	183,300
Number of men working daily at yearend:					
Underground persons	115,090	110,900	107,694	102,959	94,292
Surface do	46,795	44,951	43,352	41,504	39,679
In associate plants do	9,894	9,307	8,937	8,921	8,625
Production per man-shift:					
Nord/Pas-de-Calais:					
Underground kilograms	1,663	1,709	1,661	1,707	1,805
Underground and surface do	1,149	1,191	1,167	1,205	1,252
Lorraine:					
Underground do	2,903	3,113	3,239	3,453	3,703
Underground and surface do	1,902	2,078	2,146	2,277	2,443
All of France:					
Underground do	1,958	2,046	2,038	2,104	2,241
Underground and surface do	1,332	1,411	r 1,397	1,446	1,523
Power production by pithead steam plants:					
Quantity million kilowatt-hours	10,931	14,762	12,146	10,233	11,812
Share of thermal power produced in France percent	24.4	25.0	22.1	18.8	17.7
Share of total power produced in France do	12.4	15.7	12.0	9.6	10.6
LIGNITE					
Production	2,471	2,244	2,690	2,564	2,931
Stock at yearend	485	456	r 452	520	379
Average number of days worked	256	259	274	274	260
Average daily output metric tons	9,700	8,600	9,800	9,300	10,400
Number of men working at yearend:					
Underground percent	1,853	1,780	1,662	1,582	1,515
Surface do	1,066	1,030	1,046	1,051	1,053
Associated plants do	146	111	115	125	130
Production:					
Underground man-shift only kilograms	3,890	4,103	4,243	4,477	4,870
Total man-shifts do	3,579	3,334	r 3,938	NA	NA

e Estimate. r Revised. NA Not available.

[1] Largely 14 to 18 percent volatile matter; a small tonnage has a higher volatile content.

[2] 16 to 28 percent volatile matter.

[3] 25 to 41 percent volatile matter.

[4] 40 to 42 percent volatile matter for the bulk of production in this category.

[5] Detail does not add to total (official data) because of differences in source.

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Table 10.—France: Coal availability and distribution

(Thousand metric tons)

	1966	1967
Net production	50,338	47,624
Middlings, foreign coal, etc.	173	151
Stock variations [1]	+3,068	+1,205
Total availability	47,443	46,570
Consumption by mines and mine powerplant	6,888	7,419
Delivery to miners	884	801
Delivery for transformation:		
Mine coke ovens	9,876	9,370
Steel plant coke ovens	2,208	2,222
Gas coke ovens	257	84
Briquetting plants	3,784	3,733
Total	23,892	23,629
Exports	670	711
Total available from domestic production	22,881	[2] 22,237
Imports	11,485	11,557
Delivery from imports:		
Coal mine coke ovens	801	851
Steel plant coke ovens	3,351	3,322
Gas coke ovens	474	405
Briquetting plants	1,050	831
Delivery to mines	39	7
Stock variations [1]	+369	+147
Available from imports	5,401	5,994
Available for domestic distribution	28,282	28,231
Railroads	1,205	790
Gasworks	20	11
Electricity	9,406	10,860
Iron and steel	1,761	1,848
Other industries	8,052	7,199
Domestic and small industries	7,838	7,523

[1] Plus (+) denotes addition to stocks.
[2] Iucludes 7 tons of foreign coal.

Table 11.—France: Production, availability, and distribution of coke

(Thousand metric tons)

	1966	1967
Coal charged to coke ovens:		
Domestic	12,792	12,083
Imported	4,685	4,650
Total	17,477	16,733
Production:		
Oven coke:		
At mines: [1]	8,451	8,040
At iron and steel plants	4,183	4,166
At gas companies and independents	566	424
Total	13,200	12,630
Gas coke	14	9
Availability and distribution:		
Coke produced [1]	13,200	12,630
Receipt of coke and fines	60	------
Consumption at coking plants and by labor	800	772
Available for distribution	12,460	11,859
Stock variation [2]	+108	+38
Imports	3,701	3,220
Importers' stock variation [2]	−73	−18
Total available from domestic production and imports	16,126	15,059
Delivery to coking plants	59	3
Exports	217	210
Distribution:		
Railroads	67	57
Electricity	10	15
Iron and steel	12,844	12,061
Other industries	1,889	1,801
Domestic use and small industries	1,040	912
Total	15,850	14,846

[1] Includes semicoke and carbonized briquets.
[2] Plus (+) denotes addition to stocks, minus (−) denotes withdrawals from stocks.

Source: Bureau de Documentation Miniere. Combustibles Minéraux Solides. Statistique Annuelle Définitive. Paris, France, pt. 2, 1963–67.

Petroleum.—Domestic petroleum production in 1967 was 3.8 percent of total national refinery throughput (4.4 percent in 1966 and 4.9 percent in 1965), which increased 12.1 percent to 75.2 million tons. In spite of the Middle East crisis, internal civilian consumption of petroleum products increased by 13.9 percent to 56.7 million tons compared with increases of 7.3 percent in 1966 and 11.6 percent in 1965. The net cost of imports of petroleum and petroleum products to the French economy totaled $1,150 million. Refinery capacity was increased by 4.6 million tons to a total of 84 million tons by yearend 1967. Refinery output totaled 69 million tons.

Exploration.—During the year 79.3 man-months of seismic work and 120,000 meters of drilling was carried out in France compared with 75.8 man-months of seismic work and 130,000 meters of drilling in 1966. Exploration was centered in the Paris region and the southeast. In this latter area, deep drilling showed gas reserves in the Meillon-Saint Faust field amounting to perhaps 60 billion cubic meters. Offshore, four deep holes were drilled in the Gulf of Gascony, but commercial oil was not discovered. Oil was discovered in an exploration well, Chailly 101, in the Paris Basin.

Outside France, French companies explored for oil in Africa, North America, the North Sea (in the continental shelves of United Kingdom and Norway), and the Persian Gulf; in offshore areas in the Adriatic and off the coasts of Gabon,

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Cameroon, and Senegal; and in the Red Sea. These exploration activities gave positive results in Canada and Nigeria.

Production.—In France, there was a slight decline in crude production, but the output of the Franc zone, excluding France—Algeria, Congo (Brazzaville), and Gabon—increased to 41.89 million tons (34.77 million tons in 1966): Algeria 38.39 million, Gabon 3.45 million, and Congo (Brazzaville) the remainder. French companies accounted for 28 million tons of crude production in the Middle East and produced 700,000 tons in Canada.

Consumption.—While internal civilian consumption for all products increased by 13.9 percent, rate of increase varied for the different products as shown by the following tabulation:

Product	Quantity (thousand tons)	Change with respect to 1966 (percent)
Motor gasoline	9,881	8.9
Gas oil	3,503	12.3
Jet fuel	1,092	18.4
Aviation gasoline	72	−1.1
Domestic fuel oil	19,577	22
Residual fuel	15,204	11

French companies accounted for 51 percent of the internal market and non-French companies for 49 percent. The share of the market for selected products by French and non-French companies was as follows:

Product	Share (percent)	
	French	Non-French
Gasoline	47.3	52.7
Gas oil	53.8	48.2
Heating oil	51.4	48.6
Medium fuel	46.3	53.7
Heavy fuel	48.3	51.2

Source: Petroleum Intelligence Weekly, Apr. 15, 1968, p. 6.

A decree of July 8, 1967 permitted price increases of about 1.5 cents per gallon for gasoline and half as much for gas oil and domestic fuel oil to account for increased transportation costs resulting from the June crisis in the Middle East. Price of domestic fuel oil was increased again by 0.75 cent per liter in November. Revenues obtained from these price increases were deposited in a special account that was to be used to compensate companies for extra expenditures borne by them as a result of the increased tanker freight charges.

Trade.—Crude oil imports increased by 15 percent to 72,348,000 tons despite the Middle East crisis. Sources for imports were as follows, in percent: Franc zone 30.6, Middle East 48.1, Libya 12.1, Venezuela 3.9, U.S.S.R. 2.3, and Nigeria 3.0. Product imports totaled 4.9 million tons, a 4.2-percent increase. Algeria ranked first as a supplier of crude, followed by Iraq and Kuwait.

Exports, including bunkers, declined 0.5 percent to 14,294,500 tons (12,593,700 tons without bunker.)[18] Of the exports, excluding bunkers, heavy fuel oil ranked first (4,972,300 tons), followed by gas oil (2,866,200 tons) and gasoline (1,620,800 tons).

Refining.[19]—Of the 75 million tons of crude treated in French refineries, French crude accounted for 3.8 percent, but total Franc-zone crude for almost a third. Of the 70.4 million tons of product output, 40.8 million tons was fuel oil; gasolines were next in importance.

Increase in refining capacity resulted from the addition of a 6.5-million-ton-per-year distillation unit at Gonfreville, making this refinery, with annual capacity of 14.3 million tons, the largest in France and the third largest in Europe. The Donges and Herrlisheim refineries were also expanded.

In 1968, annual capacity of the Feyzin refinery will be enlarged from 2.3 to 6 million tons, that at La Mède from 6.4 to 10 million tons, and a new 3.6 million-ton refinery will be built at Gargenville in the Paris area. Three other refineries, each with 3 to 3.5 million tons of annual capacity, will be put in service during 1969–70; these will be located at Valenciennes, Vernon, and Thionville.

Storage capacity at refineries reached 22 million cubic meters and at distributors 5.5 million cubic meters. Underground crude storage was under consideration.

To meet input requirements of the petrochemical industry, two steam cracking units came into operation, one at Feyzin and one at Port-Jerome; a third unit will come in production at Berre in 1968.

[18] This figure is slightly different from that given in table 3 because of different sources.
[19] Bulletin de l'Industrie Pétroliere (Paris, France). No. 996, Jan. 3, 1968, pp. 5–10.

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The units which started production will increase the output of ethylene, propylene, benzene, and butadiene. The plant at Feyzin will reach its capacity of 280,000 tons of ethylene per year in 1970 and will become France's biggest producer of ethylene, followed by Esso (200,000 tons) and Napthachimie (150,000 tons). Ethylene from the Feyzin plant will be fed by a 278-kilometer pipeline into chemical factories that shared the cost of the Feyzin cracker.

Transportation.—The South European Pipeline transported 28 million tons of crude, of which one-third was for French consumption. The two products pipelines, Le Havre-Paris and Grandpuits-Paris, moved 6,250,000 tons of products to the Paris region. The construction of a product pipeline from the refineries in the Marseille area and from Feyzin to Lyon, Grenoble, and Geneva was approved during 1967.

The French tanker fleet at yearend, consisted of 90 ships totaling 3,929,000 deadweight tons (3,687,000 tons in 1966). Another 17 tankers, varying in size from 75,000 to 215,000 tons, were under construction.

Table 12.—France: Salient statistics of petroleum and natural gas industry

(Thousand metric tons unless otherwise specified)

	1963	1964	1965	1966	1967
Exploration Drilling:					
Length of hole drilled—thousand meters	237	189	182	130	120
Production:					
Crude petroleum	2,522	2,845	2,988	r2,925	2,832
Natural gas—million cubic meters	7,518	7,939	7,910	7,902	8,552
Marketed—do	4,861	5,090	5,048	5,161	5,563
Products obtained from refining natural gas:					
Liquefied products	438	490	569	503	480
Sulfur	1,409	1,511	1,521	1,520	1,636
Refining:					
Number of refineries—units	15	16	18	19	19
Capacity of refinery (atmospheric distillation)	51,830	61,930	70,280	79,180	83,805
Refinery throughput	46,702	53,284	61,359	67,060	75,202
Refinery production:					
Aviation gasoline	69	66	72	74	71
Motor gaoline	7,943	8,643	9,560	10,247	11,420
Special gasolines	246	263	317	179	210
Kerosine and white spirits	404	260	194	226	233
Light distillates for gasworks	177	562	809	1,137	1,583
Jet fuels	1,542	1,662	1,850	1,884	2,388
Distillate	4,756	5,091	5,997	6,605	6,278
Fuel oil:					
Domestic	8,609	10,691	13,493	15,785	18,396
Residual	14,643	16,623	19,069	20,171	22,398
Bitumen	1,777	2,172	2,219	2,389	2,688
Lubricants	813	871	821	866	930
Paraffins and waxes	42	49	48	57	57
Petrochemical feedstock	503	582	691	677	861
Liquefied petroleum gas	1,352	1,487	1,644	1,782	1,896
Refinery gases	1,105	1,279	733	922	944
Other	113	75	79	140	90
Total	44,094	50,376	57,596	163,139	70,443
Foreign trade:					
Imports:					
Crude:					
Franc zone:					
Algeria	15,215	17,113	17,386	18,492	21,599
Other	784	884	1,114	725	611
Subtotal	15,999	17,997	18,500	119,218	22,210
Middle East:					
Iran	2,038	3,441	5,923	4,169	3,215
Iraq	9,260	8,079	9,814	10,401	13,576
Kuwait	8,083	9,799	8,814	8,357	8,895
Qatar	1,194	1,311	1,292	1,676	2,049
Saudi Arabia	1,793	1,945	2,546	3,071	4,279
Abu Dhabi and others	466	1,453	1,802	2,777	2,802
Subtotal	22,834	26,028	130,190	130,452	134,815

See footnotes at end of table.

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Table 12.—France: Salient statistics of petroleum and natural gas industry—Continued

(Thousand metric tons unless otherwise specified)

	1963	1964	1965	1966	1967
Foreign trade—Continued					
Imports—Continued					
Crude:—Continued					
U.S.S.R.	114	92	836	1,653	1,629
Venezuela	2,649	2,595	2,668	2,402	2,800
Libya	1,661	2,290	5,863	7,280	8,729
Other	------	273	499	1,747	2,165
Total	43,257	49,275	58,556	62,752	72,348
Products imports	4,276	4,594	3,905	4,733	4,809
Exports of products including bunkering and custom refining	r 7,955	r 8,955	r 11,440	14,367	14,295
Consumption:					
Internal market	35,921	41,642	r 46,470	r 49,980	56,947
French bunkering	1,339	1,376	1,213	1,294	1,388
Other consumption including refinery and distribution losses (approximate)	5,000	5,000	5,500	6,000	6,800
Stock:					
In refinery	11,774	14,219	16,614	20,645	21,595
In distribution channels	4,540	5,161	5,763	5,294	5,959
Transportation:					
Tankers:					
Units	93	93	92	90	90
Deadweight tons	2,945	3,088	3,401	3,687	3,929
Tank cars:					
Units	16,150	18,719	19,461	19,601	19,460
Capacity—thousand cubic meters	620	782	835	862	885
Tank trucks:					
Units	8,248	10,220	11,677	12,850	14,030
Capacity—thousand cubic meters	100	126	141	159	177
Employment:					
Exploration and production—persons	11,043	10,503	10,847	10,862	NA
Refinery—do	15,895	16,266	16,125	16,208	NA
Distribution (estimated)—do	84,600	89,590	89,990	90,050	NA
Other—do	1,355	1,436	1,485	1,539	NA

r Revised. NA Not available.
[1] Detail does not add to total shown because of independent rounding.

Sources: Comité Professionel du Pétrole. Eléments Statistiques, Activité de l'Industrie Pétroliére. For the years 1963–66. V. 1, Paris, France; and Statistical Office of the United Nations.

Natural Gas.—The Lacq field remained the main source of natural gas consumed in France, accounting for 95 percent of the total marketed. By yearend 1967 the field had produced 60 billion cubic meters of gas from initial reserves of 200 billion cubic meters. Daily capacity for treatment of gas from Lacq and other gasfields of Société National des Petroles d'Acquitaine will be increased from 24 million cubic meters to 26 million cubic meters in 1968 and 34 million cubic meters by 1970. These other fields—Meillon, Sanit-Faust, Pont d'As and Rousse—discovered in the last 3 years, are estimated to have a combined 85 billion cubic meters of measured reserves.

Natural gas sales [20] totaled 5,555 million cubic meters including industry, 3,724.3 million (of which powerplants 866.8 million), town gas, 1,795.8 million; and gasoline production, 35.0 million.

Imports of Dutch natural gas started in October 1967 and totaled 151 million cubic meters. Imports from this source will increase to 5,000 million cubic meters per year. Algerian natural gas has been imported in liquefied form at the rate of 500 million cubic meters annually, but starting in 1970 additional imports will become available from Algeria, increasing to 3.5 billion cubic meters in 1973. In 1967, 746,452 cubic meters (346,310 tons) of liquefied natural gas was imported.

[20] As distinct from gas delivered for consumption which would include addition to stocks.

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The Mineral Industry of the Gabon Republic

By John R. Lewis [1]

Gabon's economy was raised significantly in 1966–67 by sharply increased production of crude oil, inauguration of petroleum refining, and continuance of manganese ore production at a high level. The country has large known deposits of manganese, iron, and uranium. Known petroleum resources are already large and new discoveries during 1966–67 indicated an excellent potential, particularly offshore. Future development of some of Gabon's mineral resources, primarily iron ore, requires the installation of adequate inland bulk transportation facilities and expansion of port facilities to handle the export.

In 1966 it was estimated [2] that over 4,000 persons were engaged in mining activities with total wages at $11 million. By 1965, per capita income had increased to $320 from $220 in 1960.

The 5-year plan of the Gabonese Government (1966–70) included a nationwide coordinated transportation system using roads, rivers, and inland and ocean marine facilities. Initial construction on the deepwater port at Owendo and on the Owendo-Belinga Iron Ore railroad was awaiting solution to financing problems. Transportation of iron ore, okume lumber, and possibly manganese will be more economically feasible when these projects, scheduled for about 1975, are completed.

PRODUCTION

Overall Gabonese mineral production continued a steady growth during 1966–67, but production of manganese declined slightly. The 1966 production of crude petroleum rose about 14 percent above that of 1965, and then jumped a dramatic 240 percent in 1967. The value of mineral production in 1967 was about $80 million, up from $53 million in 1965.[3] Gabon's first refinery went on stream in 1967, producing refined products for domestic use and export. Uranium production was down 9 percent in 1967 from 1966 and the output of gold declined 15 percent in 1967, owing to gradual exhaustion of developed deposits. The total value of mineral commodities produced in 1966 was about $61 million, while by 1967 it had risen to $80 million.

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[1] Petroleum engineer, Division of International Activities.

[2] Bulletin de l'Afrique Noire, Paris, Oct. 11, 1967.

[3] Where necessary, values have been converted from the African Financial Community franc (CFAF) to U.S. dollars at the rate of CFAF245=US$1.00.

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Table 1.—Gabon: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Gold—troy ounces	35,719	42,760	37,134	r 34,453	29,250
Manganese:					
Ore, 50–53 percent Mn	636,587	959,576	1,280,396	1,273,520	1,124,606
Battery and chemical grade pellets, 82–84 percent Mn	-------	-------	5,789	5,739	26,552
Uranium, concentrate, 20–40 percent U_3O_8	1,317	1,287	1,591	1,599	1,452
Mineral fuels:					
Natural gas, marketed—million cubic feet	321	353	397	429	646
Petroleum:					
Crude—thousand 42-gallon barrels	6,446	7,668	9,161	10,484	25,203
Refinery products: [2]					
Motor fuel—42-gallon barrels	-------	-------	-------	-------	[3] 93,041
Jet fuel—do	-------	-------	-------	-------	[3] 66,442
Diesel fuel—do	-------	-------	-------	-------	[3] 99,128
Residual fuel oil—do	-------	-------	-------	-------	[3] 223,576

r Revised.

[1] In addition to commodities shown, certain nonmetallic construction materials, such as cement, sand, gravel, and quarried limestone are produced, but quantitative data are not available.

[2] In addition to the refinery products shown, insignificant quantities of kerosine and liquefied petroleum gas were also produced.

[3] Production data are for final 3 months only. The Port Gentil refinery was put on production in October 1967.

TRADE

In the 1964–66 period, 53 percent of Gabon's exports in terms of value were mineral products—31 percent manganese, 14 percent petroleum, and 8 percent uranium. Imports were mainly manufactures, semimanufactures, and consumer goods.

The larger part of Gabon's trade was with France, although the United States was the major recipient of manganese ore. Other West European countries provided small shares of Gabon's imports. The dominant role of minerals in Gabon's trade, particularly on the export side, is shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	[1] 54.3	104.9	52.0
1966	56.7	104.9	54.2
1967	NA	112.4	NA
Imports:			
1965	8.4	62.4	13.4
1966	11.1	66.3	16.7
1967	NA	e 66.8	NA
Trade balance:			
1965	+45.9	+42.5	XX
1966	+45.6	+38.6	XX
1967	NA	+45.6	XX

NA Not available. XX Not applicable.

e Estimated, based on data for first 9 months as reported in "Etudes et Enquetes, Statistiques," Supplement au Bulletin Mensuel de Statistique, Service National De La Statisque, Republique Gabonaise, February 1968, page 4.

[1] Adjusted, based on revised import data, U.S. Agency for International Development Data Book, 1968.

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Table 2.—Gabon: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966 [1]	Principal destinations, 1966
Metals:			
Gold—troy ounces	35,205	NA	
Iron and steel:			
Scrap	1,823	510	Italy 504.
Semimanufactures	138	571	Not specified 538; France 6.
Manganese ore	1,149,462	1,181,027	United States 749,975; France 176,251; West Germany 174,657.
Uranium concentrate	1,521	[2] 1,444	All to France.
Nonferrous metals, scrap	36	71	France 47; Ivory Coast 7.
Nonmetals:			
Clay construction material	---	NA	
Minerals, crude, undifferentiated	---	NA	
Mineral fuels:			
Crude—thousand 42-gallon barrels	[r] 9,282	[2] 10,203	France 4,548; Ivory Coast 1,361; West Germany 998.
Refinery products—do	[r] NA	NA	

[r] Revised. NA Not available.
[1] Source of 1966 data except where otherwise indicated: Foreign Trade, Office of European Communities 1967, No. 6, pp. 39–50.
[2] Source: Commodity Trade Statistics, 1966; Statistical Papers Series D, V. 16, Nos. 1–34, pp. 7736–7749.

Table 3.—Gabon: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966 [1]	Principal sources, 1966
Metals:			
Aluminum	107	51	France 34; Belgium-Luxembourg 16.
Copper	41	35	All from France.
Iron and steel:			
Pig iron and ferroalloys	13	7	All from France.
Semimanufactures	15,822	[2] 23,686	France 19,525.
Lead	8	11	All from France.
Tin—long tons	2	1	All from France.
Zinc	7	9	All from France.
Metallic oxides and other compounds	317	NA	
Nonmetals:			
Cement and lime	33,431	40,715	France 24,814; Belgium-Luxembourg 13,733
Clay construction materials	213	422	France 203; Italy 89; West Germany 76.
Fertilizer, manufactured	47	215	France 206.
Sand, gravel and crushed stone	74	220	France 196; Italy 18.
Sulfur and pyrite	1,997	1,479	All from France.
Nonmetallic minerals, crude, n.e.s.	6,570	[2] 5,088	Senegal 1,988; France 841; Netherlands 803.
Nonmetallic mineral manufactures	47	41	France 27; West Germany 6.
Mineral fuels:			
Coal, coke and briquets	36	[2] 13	All from France.
Gas, natural and manufactured	623	686	Ivory Coast 337; France 319.
Petroleum refinery products—thousand 42-gallon barrels	[r] 524	663	Curacao 264; Italy 152; Iran 111.
Mineral tar and other crude chemicals from coal, oil and gas distillation	9	12	France 6; Netherlands 6.

[r] Revised. NA Not available.
[1] Source of 1966 data except where otherwise indicated: Foreign Trade, Office of European Communities 1967, No. 6, pp. 39–50.
[2] Source: Commodity Trade Statistics, 1966; Statistical Papers Series D, V. 16, No. 1–34, pp. 7736–7749.

COMMODITY REVIEW

Gabon is a significant producer of manganese ore, uranium ore, and crude petroleum. Plans are underway to exploit domestic iron deposits. High-grade limestone has been found and studies indicate the possible commercial presence of chromite, copper, and zinc. Indications are that the country also has deposits of tungsten, lead, columbium, tantalite, and diamonds.

METALS

Gold.—The mining of gold from deposits along Gabon's rivers is under the control of the Government's Société Gabonaise de Recherches et d'Exploitation (SOGAREM), and is mainly carried out

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by Gabonese villagers. SOGAREM exports most of the output to France, retaining only small amounts of gold for the local jewelery trade. Production peaked, in 1964, at slightly more than 42,000 troy ounces, and by 1966 had fallen to 34,453 troy ounces. In 1967 production was 29,250 troy ounces, down 31.6 percent from the 1964 high. Value in 1967 was $855,000, about 1.1 percent of the value of all minerals produced in that year.

Iron Ore.—Progress in developing Gabon's Belinga-Mekambo iron ore deposits was slow in 1966–67. Estimates indicated a proven reserve of 860 million tons of 64 percent iron ore located 565 kilometers inland. Keys to the iron ore development are the projected heavy-duty railroad which will tap the interior and the construction of port facilities. The Government of Gabon is determined that the construction shall be completed by 1975.

Société des Mines de Fer de Mekambo (SOMIFER), a consortium of U.S. and European firms, will develop the iron deposits. Mining facilities, transport and loading facilities are expected to cost SOMIFER approximately $275 million. The Tchibanga deposit near the Nyanga River in southwest Gabon and the Negala Massive in north Gabon near Mitzic were under study.

Manganese.—Manganese ore production in 1967 was valued at $29.6 million, accounting for 37 percent of Gabon's total mineral output.

Compagnie Miniere de l'Ogooue (COMILOG), a combine of 51 percent French interests and 49 percent United States Steel Corp., produced Gabon's entire manganese output from the Moanda ore body in the southeastern part of the country. Ore is washed and crushed at Moanda and carried via a 47-mile aerial bucket cableway and a railroad to a seaport in Congo (Brazzaville). Increased competition in the world markets and mechanical limitations have tended to limit expansion. COMILOG has located a very high-grade manganese deposit at Okondja, about 100 kilometers northeast of Moanda. Evaluation was proceeding during 1967.

Uranium.—Uranium mining and concentration in Gabon is handled by the Compagnie des Mines d'Uranium de Franceville (COMUF) which is owned primarily by private French interests and the French Atomic Energy authority. All production is exported to France. The major deposit occurs as a uranium vanadate called Francevillite at the village of Mounana. In 1967, discoveries of additional reserves within 48 kilometers of Mounana did much to add to Gabon's uranium potential. Exploitation of the Mounana deposit shifted from an open-pit operation to underground development.

NONMETALS

Cement.—On July 4, 1967, representatives of the French "Ciments de Marseille" signed an agreement with the Government of Gabon and others for a cement clinker crushing plant to be installed in the Ownedo Port area. Construction was scheduled to begin in 1968. This plant will crush clinker imported from France or Senegal and produce about 35,000 tons of cement annually.

Fertilizer Materials. — Gabon imports small tonnages of fertilizers mostly from France. There was preliminary discussion of a fertilizer plant possibly near the Port Gentil refinery which would use gas to make nitrogenous fertilizers.

MINERAL FUELS

Petroleum.—Gabon's crude reserves were estimated [4] at the end of 1967 to be 350 million barrels, a 75-percent increase from 200 million at yearend 1966.

Exploration.—Early petroleum rights in Gabon were held almost entirely by Société des Petroles de l'Afrique Equatoriale Française (SPAFE). Although about 85 percent of SPAFE's holdings of over 135,000 square kilometers were onshore, the focus in 1966–67 was offshore, which indicated greater promise. SPAFE explored alone in some of its offshore concession areas, and in others was affiliated with subsidiaries of the Royal Dutch-Shell group and/or of the Socony Mobil Oil Company. Gulf Oil of Gabon (with Shell-Gabon) was planning to undertake seismic exploration studies. American Overseas Petroleum Company, (Texaco Inc. and Standard Oil Company of California) also sought an offshore concession.

[4] Oil and Gas Journal. Dec. 26, 1966 and Dec. 27, 1967.

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Production.—A number of small fields, developed by SPAFE in the area around Port Gentil since 1958, contributed about 20,000 barrels daily to Gabon's total crude oil output by 1967. In 1965 Gabon's crude oil production averaged about 24,500 barrels daily from 73 wells. In 1967 this had increased to 56,700 barrels daily from 104 producing wells, with 45 additional wells shut in for lack of transportation. The productive capacity is expected to be around 200,000 barrels daily by 1978.

First production from the Anguille field, 8 miles offshore, was obtained in 1966 and SPAFE, the owner-operator, had drilled six wells by late 1967. Development has shown that Anguille ultimately will produce more than 20,500 barrels daily. Meanwhile, at Torpille, another offshore area southwest of Anguille and Port Gentil and further at sea, SPAFE was drilling its first well at yearend 1967.

Gabon's largest oil field is located at Gamba, 265 kilometers southeast of Port Gentil. Owned jointly by SPAFE and Shell-Gabon and operated by Shell, daily production is about 40,000 barrels of very high paraffinic crude, which is heated and sent to a floating tanker terminal where tankers of up to 65,000 tons can moor. Late in 1967 a new reservoir, Ivinga, was discovered about 6½ kilometers south of Gamba. Ultimate daily production from this reservoir is estimated at about 20,000 barrels.

Refining.—The new Port Gentil 12,500-barrel-per-day refinery was in operation by October 1967. It was built through joint efforts of private interests working with the member nations of the Central African Customs and Economic Union (UDEAC). These governments—Cameroon, Central Africa, Congo (Brazzaville), Chad, and Gabon—each contributed 5 percent to the construction. Established marketing companies in the five countries and French interests provided the remaining 75 percent of the capital. The refinery is operated by the specificially created Société Equatoriale de Raffinage. All major products are made and they will be sold in the UDEAC countries.

Natural Gas.—In the face of rising crude oil production, most gas is flared. Around 900,000 cubic feet per day goes to an electric generating station in Port Gentil for boiler fuel.

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The Mineral Industry of East Germany

By Bernadette Michalski [1] and L. Nahai [2]

East Germany's most significant mining operations in 1967 continued to be lignite and potash, with production of the former probably at the maximum feasible level. Based mainly on imported ores, significant amounts of ferrous and nonferrous metals were also produced. These include iron and steel, aluminum, antimony, copper, lead, zinc, and small quantities of nickel. It is estimated that in 1967 the domestic mining industry supplied 15 percent of the national consumption requirements for coal and zinc, about 25 percent of requirements for copper, iron ore (iron content), and pyrite (sulfur content), and about 12 percent of the lead requirement. The number of operations, employment in the industry, and value of production by sectors in 1966 are shown in the following tabulation.

Mineral industrial sector	Number of operations	Employment	Value of production (millions)
Metallurgy (other than iron and steel)	15	44,733	$346
Iron and steel	16	69,346	729
Nonferrous metal mines	3	1,911	3
Potash and salt	16	28,026	116
Bituminous coal and coke plants	6	19,186	35
Lignite and lignite briquet plants	33	112,339	360
Petroleum (refining and petrochemical)	29	40,058	660

In 1967 the "produced national income" [3] increased 5 percent over the 1966 level, which was estimated at about $2 billion at the unofficial exchange rate of 4.2 MDN [4] = US$1. Industrial output as a whole increased 6.3 percent. Percentage increases for some individual sectors were as follow: Energy 7.4, mining 3.9, metallurgy 5.8, chemical industry 7.0, and construction materials 4.0. However, there must have been an upward bias in these increases resulting from the third stage of industrial price reform, which went into effect on January 1, 1967. The purpose of this reform was to bring prices in line with real costs. A new economic development plan was put into effect to establish production goals for 1970.

The mining and metallurgical sector of the East German economy, including energy and building materials, showed a 6.5-percent increase compared with the planned 5-percent increase. The country is credited with producing 1 percent of the world's mineral output by value.

In 1966 the average Gross Fixed Assets (in 1962 prices) of several mineral sectors of the economy was as follows, in billions of U.S. dollars converted at 4.2 MDN = US$1: Mining (including nonferrous metals other than copper) 4.8, energy 4.6, metallurgy (including foundries and forging shops) 2.3, and construction materials

[1] Commodity research specialist, Division of International Activities.
[2] Chief area specialist, Europe, Division of International Activities.
[3] Defined as the net social product excluding services, or as the value of material products only. It comprises the total value of goods and productive services, including turnover taxes, produced by the economy during the year.
[4] Mark der deutschen Notenbank. The official rate is 2.2 MDN=US$1.

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1.3. The chemical industry, which includes the aluminum industry and oil refining, had a value of $5.2 billion. The average annual rate of increase of the Gross Fixed Assets for various mineral industry sectors follows in percent:

Sector	1956–61	1962–66
Mining	10.2	8.6
Construction materials	8.0	7.4
Energy	5.5	7.8
Metallurgy (including copper)	3.6	7.9

Since 1963–64, industrial investment in iron and steel has been directed toward increasing the production of quality and alloy steels and expanding facilities for producing intermediate products, such as pipes and tubes. In the chemical industry, the capacity for oil refining, petrochemicals, and aluminum production has been increased.[5]

[5] Melzer, Manfred, "Das Anlagevermoegen der Mitteldeutschen Industrie 1955 bis 1966." (The Gross Fixed Assets of Middle German Industry). Deutsches Institut fuer Wirtschaftsforschung, Vierteljahrshefte zur Wirtschaftsforschung, (The German Institute for Economic Research Quarterly Volume for Economic Research), v. 1, 1968, pp. 105–132.

Table 1.—East Germany: Production of selected mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Aluminum:					
Alumina	61	62	e 62	e 62	NA
Aluminum metal e	45	45	50	50	NA
Cadmium e, kilograms	5,000	10,000	10,000	10,000	NA
Copper ore	1,626	1,563	1,433	1,297	NA
Iron and steel:					
Iron ore	1,661	1,634	1,630	1,721	1,750
Pig iron	2,150	2,260	2,338	2,448	2,520
Steel ingots	4,093	4,310	4,366	r 4,541	4,700
Rolled products	2,813	2,900	2,986	3,050	NA
Nonmetals:					
Cement	5,458	5,767	6,087	6,456	7,188
Fertilizers:					
Nitrogenous (N content)	340	334	348	344	NA
Phosphatic (P_2O_5 content)	196	198	232	254	305
Gypsum, calcined	214	223	217	218	NA
Lime [2]	3,457	3,673	3,441	3,662	NA
Potash, crude (K_2O content)	1,845	1,857	1,926	r 2,006	NA
Salt	2,078	2,078	1,890	1,911	NA
Sulfur (content of pyrite)	44	42	44	r 54	NA
Sulfur, elemental, recovered	120	125	125	128	e 130
Mineral fuels:					
Coal:					
Bituminous and anthracite	2,483	2,340	2,212	r 1,987	1,800
Brown	254,219	256,926	r 250,836	r 249,036	NA
Brown-coal briquets	60,256	61,504	60,380	59,426	NA
Coke from—					
Bituminous coal [3]	3,262	3,398	3,209	r 3,191	e 3,250
Brown coal [4]	7,568	7,608	7,342	r 7,323	e 7,350
Manufactured gas, million cubic feet	125,475	r 112,830	r 120,241	122,223	134,633
Petroleum:					
Refinery products:					
Gasoline	1,316	1,461	1,604	1,776	NA
Diesel fuel	1,749	2,024	2,258	NA	NA
Fuel oil	1,558	1,936	2,248	NA	NA

e Estimate. r Revised. NA Not available.

[1] In addition to reported commodities, East Germany was a known producer of the following (figures represent approximate order of magnitude): Smelter copper 20,000; mine lead 12,000; smelter lead 25,000; nickel 100; silver 4.8 million troy ounces; mine tin 1,000; smelter tin 1,200; mine zinc 12,000; smelter zinc 11,500; fluorspar 80,000; and peat 500,000.

[2] All types including industrial.

[3] Includes gas coke.

[4] Includes high-temperature coke.

Sources: Staatlichen Zentralverwaltung für Statistik (Central Statistical Bureau), Statistisches Jahrbuch der Deutschen Demokratischen Republik 1967 (Statistical Yearbook of the Germany Democratic Republic for 1967). Berlin, 1967, 615 pp. Staatlichen Zentralverwaltung für Statistik (Central Statistical Bureau), Statistische Praxis (Statistical Practice) No. 2, Jahrgang (volume) 23, Berlin, 1968, 128 pp.

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PRODUCTION

Although statistics on 1967 mineral output were available for only a few commodities, there appeared to be a general pattern of increase. Only coal reported a decrease of about 9 percent.

TRADE

Potash and lignite remained the most important crude mineral exports of East Germany. Potash is regularly exported to many countries. West Germany remained the principal market for lignite and in 1967 imported 2,341,900 tons of lignite briquets and similar products. East Germany made a trade agreement with India that provided for increased delivery of fertilizers.

The bulk of East Germany's mineral trade is conducted with the U.S.S.R.,

Table 2.—East Germany: Exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum [2]	8,050	11,089	United Kingdom 5,583; Austria 3,014; Italy 1,709.
Copper:			
Concentrates [2]	4,005	2,245	All to Poland.
Metal [2]	2,223	NA	
Iron and steel:			
Scrap [2]	88,008	131,631	Switzerland 40,773; Sweden 35,390; Austria 32,532.
Pig iron and ferroallys [2]	385,063	NA	
Steel, primary forms [2]	2,056	NA	
Semimanufactures [2]	81,970	NA	Poland 18,924.[3]
Lead and alloys, unwrought [2]	110	NA	
Nickel: Matte and speiss [2]	510	NA	
Tin: [3]			
Concentrates	7,389	11,027	All to Poland.
Metal	20	-------	
Tungsten concentrates [3]	102	30	All to Poland.
Zinc and alloys, unwrought [2]	426	NA	
Nonmetals:			
Cement	r 379,800	229,900	Spain 130,000;[2] West Berlin 95,627.
Clay, kaolin	69,983	72,670	Undisclosed.
Feldspar, fluorspar [2 4]	11,757	5,202	Austria 2,501; Yugoslavia 1,951; Belgium-Luxembourg 650; U.S.S.R. 100.
Fertilizers:			
Potash	10,257	9,393	Undisclosed.
Potassic salts, raw, thousand tons (K_2O content).	1,291	1,374	Czechoslovakia 370; Poland 370; United Kingdom 120.
Nitrogenous, N content do	73	48	United Arab Republic 17; India 11.
Gypsum, burned	60,730	33,094	Undisclosed.
Salt [2] thousand tons	130	140	Sweden 61; Finland 52; Norway 13.
Sulfur	6,009	8,032	Mostly to Austria.
Mineral fuels:			
Lignite briquets thousand tons	5,962	5,255	West Germany 1,940; Czechoslovakia 920.
Coke, all kinds do	124	74	Undisclosed.
Petroleum:			
Refinery products:			
Gasoline thousand tons	473	116	Do.
Diesel fuel do	676	513	West Germany 222.
Heating oil do	269	204	Austria 47.
Mineral waxes do	18	19	West Germany 12.
Carbon black [4]	1,000	1,000	All to the U.S.S.R.

r Revised. NA Not available.

[1] Because East Germany publishes only limited data on foreign trade in minerals, this table has been compiled from several sources. Except as noted, information is from Statistisches Jahrbuch der Deutschen Demokratischen Republik 1967 (Statistical Yearbook of the German Democratic Republic 1967), Berlin, 615 pp.

[2] Statistical Office of the United Nations. 1966 Supplement to the World Trade Annual. Vol. 1, East Europe. Walker and Co. New York, 1968, 384 pp.

[3] Glowny Urzad Statystyczny (Central Statistical Office) Rocznik Statystyczny Handlu Zagranicznego 1966 (Foreign Trade Statistical Annual for 1966) Warsaw, 1967, 468 pp.

[4] Ministerstvo Vneshney Torgovli S.S.S.R. (Ministry of Foreign Trade of U.S.S.R.) Vneshnyaya Torgovlya S.S.S.R. za 1966 God (Foreign Trade of the U.S.S.R. for 1966) Moscow, 1967, 334 pp.

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Czechoslovakia, and Poland. Imports of iron ore from Soviet Union continued at a rate of more than 2.5 million tons annually; however, the East Germans reported a sharp drop in the iron content of Soviet ores imported in 1966.

East Germany's most significant trading partner outside the Communist sphere was West Germany. Trade with West Germany declined in 1966, with a decreased demand for lignite briquets and a cut in diesel fuel exports to West Germany. The decline in imports from West Germany was reportedly due to clearing difficulties affecting steel deliveries.

Table 3.—East Germany: Imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	250,106	290,100	Hungary 185,025; Yugoslavia 102,101.
Alumina	46,183	29,058	Hungary 18,958.
Ingots [2]	87,300	90,000	All from the U.S.S.R.
Semimanufactures	13,400	13,300	Mainly from the U.S.S.R.
Cadmium, metal [2 3]	301	306	U.S.S.R. 203; Poland 103.
Chromite, Cr_2O_3 content	30,082	29,590	U.S.S.R. 24,000.[3]
Copper:			
Metal [2 4]	43,202	43,700	U.S.S.R. 42,900.
Alloys [2]	2,000	1,900	All from the U.S.S.R.
Iron and steel:			
Iron ore, Fe content—thousand tons	1,452	1,456	U.S.S.R. 829; India 30.
Scrap [2]—do	153	154	All from the U.S.S.R.
Pig iron and ferroalloys—do	774	649	Do.
Semimanufactures—do	2,273	2,513	U.S.S.R. 2,135.
Lead [2 3]	43,100	48,300	Mainly from the U.S.S.R.
Magnesium [2]	2,555	1,493	All from the U.S.S.R.
Manganese ore, Mn content—thousand tons	85	74	U.S.S.R. 59; Rumania 15.
Nickel [2]	1,600	2,100	All from the U.S.S.R.
Zinc [2 3]	33,220	42,574	U.S.S.R. 36,800; Poland 5,774.
Nonmetals:			
Asbestos	28,660	26,839	Mainly from the U.S.S.R.
Bentonite [5]	------	4,796	All from Yugoslavia.
Cement [3]	47,426	38,970	All from Poland.
Clay refractory [3 6]	16,182	15,523	Czechoslovakia 14,000; Poland 1,523.
Fertilizers:			
Raw:			
Apatite ore [3]	------	8,500	All from the U.S.S.R.
Apatite concentrates [3]	783,700	786,500	Do.
Manufactured:			
Nitorgenous fertilizers, N content	134,584	112,855	Mainly from the U.S.S.R.
Phosphatic fertilizers, P_2O_5 content	88,125	73,368	Do.
Graphite	5,534	4,449	U.S.S.R. 3,100.[3]
Pyrite [3]	240	241	All from the U.S.S.R.
Sulfur [3]	36,036	6,970	All from Poland.
Mineral fuels:			
Coal:			
Anthracite [3]—thousand tons	159	109	All from the U.S.S.R.
Bituminous—do	9,464	9,168	U.S.S.R. 5,982; Poland 1,986.
Brown coal—do	5,218	5,066	Poland 5,032.
Coke—do	3,205	3,232	U.S.S.R. 1,457; Poland 899; Czechoslovakia 808.
Gas, manufactured—million cubic feet	1,295	2,246	Undisclosed.
Petroleum:			
Crude—thousand tons	5,132	6,469	U.S.S.R. 6,190; United Arab Republic 104.
Refinery products:			
Gasoline [3]—do	130	138	All from the U.S.S.R.
Diesel fuel [3]—do	336	44	Do.
Lubricants [3 4]—do	15	21	Austria 15; U.S.S.R. 4.
Petroleum coke [3]—do	11	12	All from the U.S.S.R.
Carbon black [3]	6,400	7,500	Do.

[1] Because East Germany publishes only limited data on foreign trade in minerals, this table has been compiled from several sources. Information except as noted is from Statistisches Jahrbuch der Deutscher Demokratischen Republik 1967 (Statistical Yearbook of the German Democratic Republic 1967). Berlin, 615 pp.

[2] Ministerstvo Vneshney Torgovli S.S.S.R. (Ministry of Foreign Trade of U.S.S.R. Vneshnyaya Torgovlya S.S.S.R. za 1966 God. (Foreign Trade of the U.S.S.R. for 1966), Moscow, 1967, 334 pp.

[3] Glowny Urzad Statystyczny (Central Statistical Office) Rocznik Statystyczny Handlu Zagranicznego 1966 (Foreign Trade Statistical Annual for 1966) Warsaw, 1967, 468 pp.

[4] Statistical Office of the United Nations. 1966 Supplement to the World Trade Annual. Vol. 1, East Europe: Walker and Company, New York, 1968, 384 pp.

[5] Savezni Zavod za Statistiku (Federal Institute for Statistics) Statistika Spolyne Trgovine S.F.R. Yugoslavije za 1966 godinu (Statistics of Foreign Trade of S.F.R. Yugoslavia for 1966), Belgrade, 1967, 526 pp.

[6] Statni Statisticky Urad (Central Statistical Office) Statisticka Rocenka CSSR, 1967 (Statistical Annual for Czechoslovakia 1967) Prague 1967, 614 pp.

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COMMODITY REVIEW

METALS

Copper.—Copper ore was presumably being produced from the Sangerhausen deposit. It may be presumed that the deposit near Eisleben has been substantially exhausted.

Iron and Steel.—The steel industry continued to depend heavily on imported ore that is of a higher grade than that produced domestically at Elbingerade in the Harz area and at Schmiedfeld in the Thuringer Wald area.

The 1967 crude steel production capacity in East Germany was estimated at 5 million tons, compared with a little over 4 million tons in 1963. The capacity is expected to increase to 5.5 million tons by 1970. With an output of 4.7 million tons of crude steel in 1967, steel plants were producing at nearly full capacity. Apparent consumption, in terms of crude steel equivalent, was about 7.4 million tons (430 kilograms per capita). The balance was imported, principally from the U.S.S.R.

Steel furnaces have operated on a high scrap percentage in accordance with the proposal for the introduction of additional, larger arc furnaces. Although the industry is dependent upon imported coking coal from Czechoslovakia, small quantities of brown coal gas are used to fire open hearth furnaces, and brown coal dust is injected into blast furnaces. Domestic brown coal is also coked for use in domestic low-shaft furnaces.

East Germany's principal iron and steel plants and their capacities are reported as follows:

Plant	Facilities and capacities
VEB Stahl und Walzwerk Brandenburg	Eleven open hearths of 120- to 260-ton capacity.
VEB Stahl und Walzwerk "Wilhelm Florin"	Open-hearth and electric steel furnaces with total ingot steel capacity of 1.2 million tons.
VEB Eisenhuettenkombinat Ost	Six 700-cubic-meter blast furnaces with a pig iron annual capacity of 1.5 million tons. Oxygen converter to be operational by 1972.
VEB Maxhuette	Four blast furnaces, Bessemer converters, open hearth, and electric furnaces.
VEB Niederschachtofenwerk	At least 10 low shaft furnaces with a total annual capacity of 350,000 tons. Produces low-carbon high-manganese iron.
VEB Edelstahlwerk "8 Mai 1945"	Two 18-ton arc furnaces. Two 10-ton arc furnaces. Two 5-ton arc furnaces. Two 20-ton open-hearth furnaces. Special steels are produced in roughing, intermediate and finishing mills.
VEB Stahl und Walzwerk Gröditz	Twelve 15- to 100-ton open-hearth furnaces. Six electric furnaces, annual ingot capacity of 200,000 tons.
VEB Stahl und Walzwerk Riesa	Open-hearth and electric furnaces.

Table 4.—East Germany: Principal nonferrous metallurgical plants (yearend 1967)

Commodity, company, and location	Annual capacity (Metric tons)	Type of plant
Aluminum:		
Lauta Werke: Hoyerswerde	20,000	Smelter.
VEB Electrochemische Kombinat: Bitterfeld	35,000	Do.
VEB Leicht Metalwerk: Rackwitz	NA	Rolling mill
Antimony:		
Antimonbergwerk: Oberbohmsdorf	NA	Smelter.
Copper:		
VEB Mansfeld Kombinat "Wilhelmpeck":		
Lutherstadt	25,000	Do.
Hettstedt	30,000	Smelter and copper and brass rolling mill.
VEB Kupfer und Blechwalzuweske "Michael Niederkerchner": Ilsemburg/Harz.	NA	Foundry and refinery.
VEB Huttenwerke Kayser: Wiederschönweide	25,000	Refinery.
Nickel:		
Sankt Egidien: Sankt Egidien	NA	Do.
Lead and zinc:		
VEB Bergbau "Albert Funk": Freiberg	NA	Lead and zinc smelter and precious metals recovery unit.
Tin:		
VEB Bergbau "Albert Funk" Zinnhuette: Freiberg	NA	Refinery.

NA Not available.

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Lead and Zinc.—Lead and zinc ores have been obtained from mines in the Freiberg and Brand areas. A zinc smelter of 15,000-ton annual capacity was scheduled to start operation in 1961 at Freiberg.

Tin.—A facility for tin recovery from tin-bearing residue at the VEB Albert Funk Mining and Metallurgical Combine at Freiberg was under trial operation in late 1967.

NONMETALS

Among nonmetallics, besides salt and potash, of which East Germany is an important world producer, fluorspar is produced in excess of local consumption although data on production are not available.

MINERAL FUELS

Data on production, trade, and consumption, tabulated below, show that lignite has remained East Germany's dominant energy source, although petroleum imports have increased:

	Thousand metric tons of standard coal equivalent		
	1963	1964	1965
Production:			
Brown coal	72,612	73,390	71,762
Other (bituminous coal, petroleum)	2,712	2,583	2,603
Total	75,324	75,973	74,365
Imports:			
Hard coal	10,590	11,997	11,091
Petroleum	4,514	6,088	7,340
Other	1,867	1,877	1,735
Total	16,971	19,962	20,166
Exports:			
Brown coal briquets	4,690	4,566	4,004
Diesel and heavy fuels	1,442	1,598	2,028
Other	275	332	304
Total	6,407	6,496	6,336
Apparent consumption	85,888	89,439	88,195

Source: Deutsches Institut für Wirtschaftsforschung (German Institute for Economic Research), Institut für Konjunkturforschung (Institute for Market Research). Wochen Bericht. Oct. 21, 1966, 8 pp.

The results of petroleum exploration was negative but Erdoel und Erdgascombinat discovered natural gas at Salzwedel. The 300-kilometer Schwedt-Leuna gas pipeline and the Schwedt-Berlin gas pipeline were declared to be in full operation in December. This oil pipeline is the first part of a planned pipeline system to lower oil transport costs and reduce the burden on railroad transportation.

The 70-megawatt Rheinsberg nuclear powerplant was in operation during 1967 and apparently fulfilled its output plan. A new plant, Atomkraftwerk Nord, reportedly with a 500-megawatt capacity, will be established at Griefswald.

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The Mineral Industry of the Federal Republic of Germany

By L. Nahai [1]

The value of crude mineral production in the Federal Republic of Germany in 1967 totaled about $2,874 million.[2] The gross national product, GNP, estimated at $120 billion in 1967 rose only 0.3 percent in current prices, but fell half of 1 percent in constant prices. The index of industrial production fell from 160 in 1966 to 157 in 1967 (1958=100). The relatively static position of the GNP influenced many segments of the mineral industry.

In 1966, West Germany's mineral industry (mining and ferrous and nonferrous metals industries), excluding petroleum refining and processing, contributed $9,937 million to the GNP, 8.3 percent of the total. This sum was distributed as follows: Mining $2,307 million; ferrous and nonferrous metal industries $4,790 million; and industries based on stone, earth, fine ceramics, and glass $2,840 million. This contribution includes the output of some industrial sectors that are properly classified as manufacturing. Data on petroleum refining and processing are not available separately but are included in the chemical industry, which as a whole contributed $6,290 million to the GNP.

Total turnover of the mineral industry in 1967 for the various operations shown in table 1 was about 10.9 percent of the $95,165 million recorded turnover for all industry. Average monthly industrial employment totaled 7.84 million in 1967 of which the mineral industries [3] accounted for 12 percent.

Government mineral related actions concontinued to be oriented mainly toward the problems of the coal industry. To assist this industry, in May 1967 the taxes on heavy and light oils, respectively, $6.25 and $2.25 per ton, were extended to April 30, 1971. These taxes were levied first in 1960. Action was taken to increase use of coal in powerplants by about 2.5 million tons per year. The voluntary self-restraint agreement with oil companies for light and heavy fuel oils was also continued. A growth rate of 4 percent for light oils and 3 percent for heavy oils was established for 1968; these rates were in effect in 1967. The "Law to Promote Rationalization in Hard Coal Mining" was amended whereby the Government is authorized to grant loans, furnish guarantees, and pay premium for mine closures until August 31, 1971, provided applications are filed prior to August 1968. The Law on Miners Premium was modified and supplemented, authorizing a bonus of 62.5 cents per shift for all miners instead of a gradual bonus for different types of miners.

On June 5, the Government sent a draft "Law for the Adaptation and Rehabilitation of the German Hard Coal Industry and the German Hard Coal Areas" to the Parliament. This bill has provisions to reduce coal production to a marketable amount, to consolidate companies, and to aid in establishing new industries in the Ruhr and Saar areas. A Commissioner for Hard Coal and Hard Coal Areas, advised by an 18-member Advisory Board, would have responsibility to carry out the three objectives of the bill. However, by the end of the year the bill had not been acted upon.

Several schemes were proposed to assist

[1] Chief area specialist, Europe, Division of International Activities.

[2] Where necessary, values have been converted from West German marks (DM) to U.S. dollars at the rate of DM4=US$1.

[3] Mining, iron and steel (but excluding foundries, and cold rolling and drawing mills), industries based on stones and earths, nonferrous metals (but excluding foundries), and petroleum refineries.

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Table 1.—Federal Republic of Germany: Employment and turnover in the mineral industry

	Average 1967 employment (thousand persons)	Turnover (million dollars)			
		1966		1967	
		Domestic	Foreign	Domestic	Foreign
Mines:					
Iron	6	39	2	38	2
Nonferrous metals	6	25	1	24	3
Potash and salt	18	143	58	146	49
Other nonmetallic minerals	2	8	4	8	4
Coal	305	1,340	435	1,227	417
Lignite	31	278	15	239	14
Peat	5	26	3	27	4
Oil and gas	8	147	1	165	2
Total	[1] 378	2,006	517	1,874	495
Quarries:					
Stone	30	312	4	298	4
Sand and gravel	15	207	8	192	10
Slate, clays, other	7	50	8	44	8
Cement	21	508	14	459	15
Refractories	15	119	37	109	33
Lime, gypsum, chalk	16	202	11	196	11
Limestone, sandstone	6	102	-------	96	-------
Pumice	7	112	1	101	8
Total	116	1,612	83	1,495	89
Processing plants:					
Iron and steel	327	3,842	1,212	3,495	1,517
Nonferrous plants	84	1,330	423	1,228	396
Petroleum refineries	33	3,252	124	3,492	132
Coal chemicals	4	58	16	61	19
Total	448	8,482	1,775	8,276	2,064
Grand total	942	12,100	2,375	11,645	2,648

[1] Data does not add to totals shown because of independent rounding.

the industry. Generally, these proposed the reorganization and consolidation of mining companies in the Ruhr area under the management of a holding company owned by private interests. The holding company would adjust coal production over a period of time to the level of market demand, accelerate closure of inefficient mines, encourage the reallocation of investment resources to alternative uses in the Ruhr area, and operate the remaining mines at maximum efficiency. By yearend no decision had been made on any of the plans.

In 1967, the 6-million-ton-tariff-free quota for coal imports from non-EEC countries was extended for the three year period 1968–70. The Federal Government may, however, revise the quota for a given year by as much as 20 percent either upward or downward. Another provision bans the carryover from 1 year to the next of import licenses issued but not utilized.

Subsidized prices for German coal shipped to steel companies, a longterm objective of the steel industry, came to fruition. On February 21, 1967, the High Authority of the European Coal and Steel Community authorized Member States to grant aid to the coal industry so that prices for coking coals and coke delivered to the Community's iron and steel industry could be reduced. The aid which in the first instance will run until the end of 1968, authorized governments to subsidize their domestic coal industry by a uniform rate of $1.70 per ton. A common compensation fund, with a $22 million ceiling, was set up by the High Authority for coking coal traded among the six countries. The German Government will subsidize coal shipped to German steel producers.

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PRODUCTION

West Germany's rank as a world producer of minerals and metals in 1967 remained very much the same as in 1965: First in the production of pumice; second in barite, feldspar and fuel briquets; third in lime, potash, and coke; and fourth in cement, pig iron, and crude steel.

The index of industrial production in 1967 fell 2.2 percent. For mining, the decline was more severe—5 percent from 98 in 1966 to 93 in 1967. The building industries had the highest rate of decline among industry groups (146.4 in 1967 compared to 166.3 in 1966). By contrast, the increase in the production index for energy industries, 4.2 percent, was highest for all industry sectors. Performance of the various sectors of the mineral industry (montly averages) was as shown below:

Industry sector	Index of production (1958=100)	
	1966	1967
Coal mining	89.0	81.7
Metal ore mining:		
Iron ore	54.5	50.4
Other	99.7	109.4
Potash and salt	142.0	136.6
Crude oil and gas	211.0	225.8
Stone and earth	157.9	148.2
Iron and steel	137.1	143.8
Nonferrous metals	150.0	152.1

Table 2.—Federal Republic of Germany: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Aluminum:					
Bauxite	4,331	4,156	3,893	r 3,667	NA
Aluminum hydroxide, aluminum oxide content—thousand tons	547	612	657	r 701	741
Metal:					
Unalloyed:					
Primary—do	209	220	234	244	253
Remelted, including scrap—do	16	r 19	20	20	21
Alloyed, including some remelted scrap—do	141	169	183	177	165
Semimanufactures—do	255	316	319	r 366	381
Crude castings—do	130	159	179	169	145
Arsenic (exports of arsenic acid)	56	38	71	377	104
Bismuth	126	175	e 125	e 75	NA
Cadmium	223	320	328	356	399
Cobalt	1,508	1,445	1,356	1,109	883
Copper and copper alloys:					
Copper in ores [1]	2,282	1,596	1,074	r 1,257	1,175
Blister copper—thousand tons	67	68	74	70	NA
Refined, unalloyed:					
Electrolytic—do	235	232	247	255	267
Refined from scrap—do	68	104	110	120	116
Copper alloys	35	39	42	33	31
Semimanufactures—thousand tons	593	760	769	684	685
Crude castings, including alloys	78,186	91,160	93,210	74,905	70,536
Gold (smelter)—thousand troy ounces	127	109	80	102	74
Iron and steel:					
Iron ore—thousand tons	12,898	11,613	10,847	9,467	8,553
Spiegeleisen and blast furnace ferromangnese—thousand tons	290	287	280	296	254
Pig iron—do	22,619	26,895	26,710	25,117	27,112
Electric furnace ferroalloys—do	105	131	NA	148	NA
Steel ingots and castings—do	31,597	37,339	36,821	35,316	36,744
Of which castings—do	575	637	650	r 577	526
Finished steel—do	20,991	24,953	24,837	24,244	24,922
Lead and lead alloys:					
Lead in ore—do	53	49	50	r 56	59
Smelter:					
Primary—do	r 140	108	104	110	136
Secondary—do	90	116	123	138	153
Alloys, unwrought—do	17	21	21	22	19
Semimanufactures and castings	48	57	55	r 56	56
Magnesium and magnesium alloys:					
Unwrought	3,187	3,141	2,187	1,516	2,236
Semimanufactures	373	538	522	488	451
Castings	31,614	38,499	37,994	36,472	28,762
Mercury—76-pound flasks	1,595	1,740	2,176	2,030	NA
Molybdenum	115	208	262	e 230	162

See footnotes at end of table.

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Table 2.—Federal Republic of Germany: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals—Continued					
Nickel, including powder	1,935	761	305	318	NA
Platinum troy ounces	1,736	2,186	1,479	1,190	9,932
Silver:					
In ores thousand troy ounces	2,067	2,063	2,022	r 2,018	NA
Smelter do	12,003	11,580	10,409	13,877	16,480
Tin and tin alloys:					
Refined unwrought [2] long tons	2,212	2,274	2,505	2,473	2,549
Alloys, unwrought and solder do	18,242	19,453	20,975	22,041	21,716
Tungsten, minimum 90 per cent tungsten	r 476	649	825	689	NA
Zinc and zinc alloys:					
Zinc in zinc ore	r 92	96	95	98	106
Zinc in pyrite	16	15	14	8	
Metal:					
Primary thousand tons	105	107	108	123	103
Secondary do	68	69	81	r 92	84
Alloys do	39	59	63	r 63	61
Semimanufactures do	70	85	83	74	74
Castings	35	45	49	48	40
Nonmetals:					
Barite (marketable) thousand tons	r 457	r 467	r 469	r 451	428
Basalt lava and lava sand do	4,968	r 5,212	5,820	5,975	NA
Bromine and bromine compounds	2,139	2,236	2,945	[3] 2,101	c [3] 2,300
Calcite thousand tons	37	42	46	34	NA
Cement:					
Portland do	21,519	24,789	25,435	25,782	23,662
Iron portland and blast furnace slag do	6,831	7,881	7,865	8,089	7,004
Other cement and mortar do	868	962	833	867	841
Chalk do	72	94	100	109	108
Clays:					
Refractory (exclusive of Klebsand) do	4,330	4,370	4,678	4,322	NA
Kaolin (marketable) do	388	409	400	r 407	e 360
Bleaching do	365	399	414	415	NA
Other (Schieferton)	71	89	87	64	NA
Corundum, artificial thousand tons	58	64	75	74	71
Diatomaceous and similar earths do	r 94	r 106	r 105	r 88	96
Feldspar do	278	305	318	r 290	298
Fluorspar do	105	90	83	r 85	98
Graphite do	13	13	14	13	NA
Gypsum do	r 1,138	r 1,278	r 1,299	r 1,316	1,116
Iodine and iodine compounds	118	119	NA	NA	NA
Lime:					
Burnt, hydraulic and burnt dolomite thousand tons	9,775	10,814	10,627	10,401	10,142
Other, ground do	2,371	2,918	3,153	3,231	3,083
Limestone, crude do	49,298	54,585	52,754	r 55,031	52,380
Of which for sale do	7,775	9,321	8,161	9,105	7,738
Mica	5	8	12	13	NA
Mineral pigments thousand tons	11	r 17	r 20	r 21	NA
Phosphates:					
Superphosphates, phosphorus pentoxide content thousand tons	53	68	81	94	73
Ground Thomas slag do	431	436	433	394	381
Other do	74	105	125	112	107
Total do	558	609	639	600	561
Potash:					
Crude salts do	18,537	20,588	22,209	21,483	19,850
K_2O content	2,283	2,553	2,740	2,645	2,460
Marketable (K_2O content) do	1,948	2,201	2,385	2,291	2,131
Pumice:					
Crude and washed do	11,161	10,321	9,333	9,660	7,898
Marketable do	6,390	5,821	5,096	5,390	4,131
Pyrite, marketable:					
Gross weight do	354	424	439	450	556
Sulfur content do	160	187	197	206	235
Quartzite do	r 271	276	281	r 267	285
Salt:					
Rock (marketable) do	5,234	5,404	5,105	r 5,122	5,868
Other (marketable) do	r 891	r 950	r 1,597	r 1,782	NA
Sand and gravel do	132,358	156,370	161,304	r 166,374	161,335

See footnotes at end of table.

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Table 2.—Federal Republic of Germany: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Nonmetals—Continued					
Sand, industrial:					
Moulding sand—thousand tons	781	879	930	1,067	761
Quartz sand (ground)—do	906	904	851	809	733
Quartz sand (unground) and glass sand—do	3,858	4,870	5,127	5,154	4,806
Other (Klebsand)—do	193	177	159	155	129
Slate: [4]					
Roofing and for office and industry—do	50	43	38	34	30
Splittings and ground—do	59	82	86	85	76
Stone:					
Crushed [5]—do	79,411	85,847	r 87,608	93,158	90,847
Building—thousand cubic meters	217	249	r 249	r 249	238
Other stones (grindstones, whetstones and printing stones)—thousand cubic meters	40	44	43	43	40
Sulfur, elemental—thousand tons	86	78	77	r 80	105
Talc, including talc schist—do	24	30	31	31	42
Trass and tuff—do	5	4	4	4	NA
Mineral fuels:					
Carbon black [5]	100	122	125	140	135
Bituminous coal and anthracite—do	142,116	142,201	135,077	r 125,970	112,043
Coal briquets—do	6,353	5,409	4,544	4,005	3,578
Lignite—do	106,669	110,945	r 101,906	r 98,088	96,766
Lignite briquets—do	15,834	15,356	12,682	11,829	11,063
Pech coal—do	1,841	1,869	1,735	1,160	890
Coke:					
At mines—do	35,213	37,394	37,903	34,990	30,652
At steelworks—do	6,682	5,956	5,391	r 4,901	4,593
At gasworks—do	4,890	4,912	4,153	3,576	2,869
From lignite—do	600	596	578	543	394
Peat (for fuel use only)—do	759	701	439	r 475	320
Gas: [6]					
Natural (associated and unassociated), refinery, and gas from oil, tar and naphtha—million cubic meters	11,234	r 15,279	19,360	22,344	NA
Blast furnace gas—do	13,435	14,840	14,005	12,230	NA
Generator and water gas—do	4,878	4,309	r 2,987	r 2,770	NA
Coke oven gas—do	22,356	22,607	r 22,045	r 20,086	NA
Other—do	643	696	729	868	NA
Total—do	52,546	57,731	59,126	58,298	NA
Natural gas:					
Nonassociated (1,000 cubic meters not converted)	914,994	1,456,815	2,220,727	2,814,853	3,713,763
Associated—do	379,954	510,307	556,913	576,781	624,280
Petroleum:					
Crude—thousand tons	7,383	7,673	7,884	7,868	7,927
Refinery products:					
Liquefied petroleum gas—do	1,102	1,380	1,476	1,605	1,743
Motor gasoline—do	8,176	9,000	9,785	10,324	10,743
Naphtha—do	916	1,304	1,606	2,164	2,660
Other gasolines—do	215	247	238	239	212
Jet fuel and kerosine—do	639	677	686	819	1,002
Diesel oil—do	7,246	6,788	6,910	8,122	8,321
Fuel oil—do	23,046	31,694	37,509	r 42,802	44,711
Lubricants—do	554	600	608	608	668
Greases—do	17	22	24	22	18
Bitumen—do	2,304	2,821	3,235	3,503	3,814
Petroleum coke—do	430	444	422	451	454
Refinery gas—do	1,470	1,880	2,542	3,143	3,684
Other—do	322	414	517	r 637	741
Total	46,437	57,271	65,558	74,439	78,771

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Includes copper content of pyrites.
[2] Includes secondary.
[3] For 1966 and 1967 bromine figures include iodine and fluorine.
[4] Exclusive of slate recovered from mine dumps.
[5] Excludes West Berlin 1963; includes West Berlin 1964–67.
[6] All volumes converted to 4,300 kilocalories per cubic meter.

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TRADE

Imports and exports of mineral commodities in 1967 constituted 26.4 and 15.8 percent, respectively, of all imports and exports of West Germany by value as shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports: [1]			
1965	r3,142	r17,892	17.6
1966	3,435	20,134	17.1
1967 [1]	3,439	21,761	15.8
Imports:			
1965	r4,401	17,472	25.2
1966	4,572	r18,022	25.4
1967	4,636	17,545	26.4
Trade balance:			
1965	−1,259	420	XX
1966	−1,137	2,112	XX
1967	−1,197	4,216	XX

XX Not applicable.
[1] Excludes coal and petroleum chemicals; 1965–66 figures exclude gold.

Among major groups of mineral commodity exports, iron and steel products ranked first in value; nonferrous metals and solid fuels ranked second and third. Among mineral commodity import groups, petroleum and its products ranked first. Details on total tonnage and value of 1967 mineral trade by major groups appear in table 3.

Table 3.—Federal Republic of Germany: Mineral and metal trade by major commodity groups in 1967

	Imports		Exports	
	Quantity (thousand metric tons)	Value (million dollars)	Quantity (thousand metric tons)	Value (million dollars)
Metals:				
Ores and concentrates:				
Iron ore, including pyrite cinder	33,793	328	384	3
Other [1]	3,370	165	103	10
Scrap:				
Iron and steel	3,511	58	3,365	77
Other	253	119	192	48
Primary forms and semimanufactures:				
Pig iron and ferroalloys	414	61	1,388	83
Steel	5,354	669	11,939	1,634
Nonferrous base metals [2]	1,097	927	610	543
Precious metals [3]	2	335	8	76
Metallic oxides including alumina	89	21	331	71
Nonmetals:				
Cement and clinker	396	6	1,236	18
Fertilizer materials, crude and manufactured	2,773	46	1,729	98
Other crude nonmetals [4]	17,499	168	21,504	75
Mineral fuels:				
Solid	9,240	115	26,619	488
Liquid and gaseous, including asphalt	91,805	1,618	8,284	215
Total	169,596	4,636	77,692	3,439

[1] Excludes materials that are primarily precious metal ores and waste.
[2] Includes metalloids such as arsenic, tellurium, selenium, phosphorus, and silicon as well as mercury, alkali metals, and rare earth metals.
[3] Includes ores, concentrates, waste and scrap of precious metals, which account for most of the tonnage but for a relatively small part of the value.
[4] Includes refractory brick and lime and nonmetal bearing metallurgical wastes except Thomas slag.

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Table 4.—Federal Republic of Germany: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	1966 destinations	
			EEC [1]	Principal destinations
Metals:				
Aluminum:				
Bauxite	1,344	4,437	2,829	Belgium-Luxembourg 2,604; Austria 1,037.
Alumina	78,691	92,129	2,980	Rumania 8,092; United Kingdom 1,099.
Aluminum hydroxide	38,178	38,383	16,632	Netherlands 9,391; Belgium-Luxembourg 6,254; Austria 4,500.
Metal and alloys:				
Scrap	856	6,858	6,798	Italy 5,801.
Unwrought	10,166	21,488	18,870	Belgium-Luxembourg 8,541; Netherlands 4,321; France 3,634.
Semimanufactures	59,642	80,290	38,372	France 13,175; Belgium-Luxembourg 10,661; United States 10,632 Netherlands 9,199.
Antimony:				
Oxides	NA	267	38	United States 187; Netherlands 36.
Metal, all forms	174	208	121	France 101; Poland 40.
Arsenic oxides	71	377	--------	Argentina 125.
Bismuth metal, all forms	72	100	79	Netherlands 48; France 20.
Cadmium:				
Metal, all forms	111	139	63	France 35; Spain 18; Belgium-Luxembourg 18.
Chromium:				
Chromite	1,746	1,197	589	Belgium-Luxembourg 330; Austria 236; Sweden 195.
Oxides and hydroxides	6,320	6,229	NA	NA.
Metal, all forms	40	80	20	United States 50; Netherlands 11.
Cobalt:				
Oxides and hydroxides	46	57	32	Italy 28; Bulgaria 11.
Metal, all forms	636	448	97	United States 344.
Copper:				
Ore, concentrate and matte	5,075	3,245	1,001	Poland 2,245; Belgium-Luxembourg 1,001.
Oxides and hydroxides	NA	1,064	444	Netherlands 211; Denmark 125; France 120.
Metal and alloys:				
Scrap	31,926	44,060	37,985	Belgium-Luxembourg 13,560; Italy 12,540; France 7,440.
Unwrought:				
Blister	872	2,179	1,740	Netherlands 818; France 690.
Refined, unalloyed	102,875	150,002	34,084	United Kingdom 29,062; France 18,556; mainland China 12,372.
Master alloys	182	253	200	Belgium-Luxembourg 160; Switzerland 44.
Other alloys	1,524	2,287	1,236	Italy 593; Austria 476; Belgium-Luxembourg 329.
Semimanufactures	70,868	91,869	24,975	United States 33,302; Netherlands 13,647; France 5,626.
Gold and alloys:				
Bullion, thousand troy ounces	317	300	203	Netherlands 124; Italy 78.
Wrought, do	153	236	24	Austria 157; Denmark 30.
Iron and steel:				
Ore and concentrate:				
Roasted pyrites, thousand tons	38	62	46	France 32; Belgium-Luxembourg 14; United Kingdom 7.
Other, do	279	300	13	Austria 284.

See footnotes at end of table.

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Table 4.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	1966 destinations	
			EEC [1]	Principal destinations
Metals—Continued				
Iron and Steel—Continued				
Scrap—thousand tons	2,010	2,016	1,984	Italy 1,807; France 120.
Pig iron, including cast iron—do	504	587	359	Italy 205; United States 68; Netherlands 50.
Sponge iron, powder, and shot—do	10	10	4	Netherlands 2; Switzerland 1; Austria 1.
Spiegeleisen—do	9	12	9	Belgium-Luxembourg 8.
Ferroalloys:				
Ferromanganese—do	56	92	14	Hungary 11; France 6; Italy 6.
Other—do	17	28	8	United States 7; Austria 3; Netherlands 4.
Primary forms:				
Ingots—do	111	124	107	France 84; Spain 17; Netherlands 11.
Blooms, billets and slabs—do	996	847	433	France 326; Spain 218; Italy 73.
Coils for rerolling—do	516	717	413	Italy 216; United States 211; France 85.
Semimanufactures:				
Wire rod—do	546	503	196	United States 108; France 93; Netherlands 46.
Other bars and rods—do	1,182	1,222	683	France 392; Netherlands 202; United States 142.
Sections—do	1,241	1,291	580	France 258; Netherlands 194; United States 138.
Plates and sheets:				
Heavy—do	1,586	1,544	739	France 321; Netherlands 160; Italy 155; United States 143.
Medium—do	149	150	63	Denmark 19; Netherlands 19; France 18; Belgium-Luxembourg 16.
Thin uncoated—do	1,037	950	384	United States 143; France 128; Belgium-Luxembourg 111; Italy 97.
Tinned—do	141	150	45	France 18; Spain 15; Portugal 14.
Other coated—do	106	166	32	United States 72; Switzerland 15.
Hoop and strip—do	448	452	241	France 105; Netherlands 105; Swtizerland 31.
Railway track and accessories—do	162	151	53	Netherlands 29; Italy 17; Switzerland 14.
Wire—do	191	215	72	France 42; United States 25; Netherlands 22.
Tubes, pipes, fittings—do	1,140	1,171	384	Netherlands 225; France 89; United States 85.
Castings and forgings, rough—do	21	24	10	Switzerland 5; Netherlands 4; Belgium-Luxembourg 3.
Lead:				
Ore and concentrate	7,029	3,932	3,932	All to Belgium-Luxembourg.
Oxides	6,786	6,133	2,431	Netherlands 1,626; Pakistan 592; Denmark 484.
Metal and alloys:				
Scrap	14,874	26,031	25,920	Italy 18,463; Belgium-Luxembourg 4,124.
Unwrought	12,823	41,553	12,175	United States 21,086; France 4,779; Netherlands 3,786.
Semimanufactures	5,519	8,817	4,032	Belgium-Luxembourg 2,954.
Magnesium:				
Oxides and hydroxides	2,278	121	72	United Kingdom 40; France 11.
Metal and alloys:				
Scrap	1,132	966	433	United Kingdom 372; Belgium-Luxembourg 236.
Unwrought and semimanufacture	133	159	96	Italy 51; Sweden 38.
Manganese:				
Ore and concentrate	9,146	5,900	2,880	Netherlands 1,602; Italy 973; Denmark 718; Austria 621.
Oxides and peroxides	137	121	72	France 11.
Metal, all forms	2,631	1,484	320	United Kingdom 1,018.
Mercury: Metal—76-pound flasks	1,769	1,653	348	United States 696; Netherlands 290.

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Molybdenum metal, all forms	84	94	68	France 67.
Nickel:				
Matte and speiss	NA	320	--------	All to Canada.
Metal and alloys:				
Scrap	1,021	1,813	725	Sweden 504; United Kingdom 434; Netherlands 327.
Unwrought	192	478	291	Belgium-Luxembourg 91; France 87; Italy 63.
Semimanufactures	5,128	6,060	2,369	Netherlands 1,220; Japan 668; France 503.
Platinum-group metals, all forms---thousand troy ounces	332	365	28	United States 90; mainland China 55; Hong Kong 37.
Silicon	33	20	2	France 1.
Silver:				
Ashes, residues, scrap	5	11	11	Belgium-Luxembourg 11.
Metal and alloys:				
Unwrought---thousand troy ounces	15,750	14,416	8,083	Italy 7,300; Czechoslovakia 1,916; Austria 1,393.
Semimanufactures---do	8,734	9,237	3,295	Switzerland 1,606; Italy 1,585; Sweden 1,404.
Tantalum metal, all forms	5	10	4	France 4.
Tin:				
Ore and concentrate---long tons	67	58	58	All to Netherlands.
Oxides---do	311	314	106	Spain 54; Netherlands 37; France 35.
Metal and alloys:				
Scrap---do	78	31	31	Netherlands 29.
Unwrought---do	1,582	1,632	1,082	France 733.
Semimanufactures---do	168	170	69	Italy 40; Netherlands 22.
Titanium oxides	32,749	29,327	10,642	Norway 4,155; Italy 3,842; France 3,262.
Tungsten:				
Ore and concentrate	161	141	--------	All to United Kingdom.
Metal, all forms	264	322	41	United States 130; Sweden 89.
Vanadium metal, all forms---kilograms	500	100	--------	All to United States.
Zinc:				
Ore and concentrate	46,286	50,800	24,800	United Kingdom 16,300; Netherlands 9,200; Belgium-Luxembourg 7,400.
Oxides and peroxides	7,509	9,196	1,614	Sweden 1,112; Turkey 931.
Metal and alloys:				
Scrap	4,236	7,643	7,617	Italy 4,169; Netherlands 1,694; France 1,657.
Zinc dust (blue powder)	1,846	3,010	1,443	Netherlands 1,236; Hungary 430; Rumania 400.
Unwrought	13,429	27,981	10,488	United States 6,350; Switzerland 5,927; Italy 5,083.
Semimanufactures	5,086	6,122	1,357	Sweden 672; Denmark 608.
Zirconium metal, all forms	7	5	2	Sweden 2.
Other:				
Metallic ores and concentrates, n.e.s	1,688	--------	--------	
Metalliferous nonferrous waste, n.e.s	71,776	104,384	77,785	Netherlands 39,057; Belgium-Luxembourg 29,399; Sweden 17,785.
Oxides and hydroxides of barium and strontium	824	1,126	789	Netherlands 443; Italy 309.
Alkali, alkaline earth, rare-earth metals	3,292	4,577	NA	NA.
Arsenic and tellurium	5	7	3	Netherlands 2.
Boron and nitrogen	1,963	2,703	1,521	Switzerland 1,118.
Columbium and tantalum	155	205	158	France 120; Italy 20.
Selenium and phosphorus	6,919	8,785	NA	NA.
Uranium and thorium---kilograms	700	600	600	All to France.
Ferrocerium and other pyrophoric alloys	171	197	NA	NA.
Other---kilograms	2,600	3,400	1,600	Belgium-Luxembourg 900; Hungary 500.

See footnotes at end of table.

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Table 4.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	1966 destinations	
			EEC [1]	Principal destinations
Nonmetals:				
Abrasives:				
Natural:				
Industrial diamond, thousand carats	45	75	55	France 25; Belgium-Luxembourg 15; United Kingdom 15.
Dust and powder of gem stones, including synthetic stones, do	80	85	50	Italy 50.
Diatomite and other siliceous earths	5,963	5,063	1,705	Austria 982; United Kingdom 773; Netherlands 737; Italy 575.
Pumice and other natural abrasives, thousand tons	593	563	560	Netherlands 381; Belgium-Luxembourg 171.
Manufactured (grinding stones)	7,585	7,920	3,084	Italy 942; France 836; Netherlands 828.
Artificial:				
Corundum	21,368	24,835	5,735	Austria 3,214; Switzerland 2,940; Sweden 2,896.
Silicon carbide	7,038	7,311	NA	NA.
Boron materials:				
Crude, excluding brine products	112	191	63	Switzerland 124.
Boric oxide and acid	77	51	-------	Yugoslavia 25.
Cement, portland, hydraulic, and other types, thousand tons	1,397	1,163	929	Netherlands 913.
Chalk, crude	1,066	4,679	4,101	Netherlands 4,051.
Clays and clay products:				
Crude:				
Kaolin, thousand tons	55	66	43	Italy 22; France 10; Switzerland 10.
Fire clay, do	359	349	253	Netherlands 89; United Kingdom 64; France 59.
Andalusite, dinas and other, do	602	650	609	Netherlands 321; Belgium-Luxembourg 135; Italy 54.
Products: Construction materials:				
Refractory, do	345	351	169	France 65; Belgium-Luxembourg 46; Italy 37.
Nonrefractory, do	304	314	217	France 104; Netherlands 65; Austria 31.
Diamonds and other gem stones:				
Diamond, except powder and dust, crude or rough cut, thousand carats	40	45	NA	NA.
Other worked, do	115	130	85	Belgium-Luxembourg 70.
Other precious or semiprecious:				
Crude or rough cut, kilograms	47,894	32,524	27,006	France 14,820; Netherlands 11,440.
Other, do	23,701	25,401	4,565	United States 11,711; France 2,022.
Dolomite, crude and calcined	90,596	99,916	92,014	Netherlands 51,125; France 22,728; Belgium-Luxembourg 18,118.
Feldspar	11,762	11,885	9,641	Netherlands 3,166; France 2,969; Belgium-Luxembourg 2,637.
Fertilizer materials:				
Crude, natural:				
Phosphatic	34,624	42,511	-------	Austria 41,742.
Potassic	86,999	54,200	48,227	Netherlands 29,754; Belgium-Luxembourg 17,660.
Organic, including guano	-------	858	754	Netherlands 709.
Manufactured:				
Nitrogenous, thousand tons	1,359	1,398	183	Belgium-Luxembourg 165; Spain 152; Brazil 102.

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Phosphatic:				
Basic slag ---- do ----	286	224	179	France 155; Austria 31; Netherlands 24.
Other ---- do ----	26	35	13	Italy 6; Netherlands 5; Cuba 5.
Potassic ---- do ----	1,916	1,688	341	Poland 270; United States 198; Netherlands 163.
Mixed ---- do ----	453	613	110	Denmark 109; France 76; Spain 59.
Ammonia, anhydrous ---- do ----	76	42	6	Norway 20; Switzerland 6; Poland 6.
Fluorspar	10,598	11,222	2,895	Austria 5,284; Netherlands 1,527.
Graphite, natural, crude or ground	7,758	7,178	2,392	Italy 1,734; United States 1,628.
Gypsum and limestone:				
Gypsum and plasters ---- thousand tons --	250	360	288	Netherlands 239; Belgium-Luxembourg 31; Switzerland 28.
Limestone, excluding dimension stone ---- do ----	42	57	56	Netherlands 52.
Lime, hydraulic or slaked ---- do ----	378	352	348	Netherlands 325.
Magnesite, crude and calcined	5,631	6,623	6,251	France 4,487; Netherlands 949.
Mica:				
Crude, powder and splittings	483	612	--------	Switzerland 273; Sweden 66.
Worked, including agglomerated splittings	r 121	91	34	Italy 15; Denmark 13; France 9.
Pigments:				
Earth colors, natural	3,389	4,384	2,147	Belgium-Luxembourg 1,171; Switzerland 505.
Iron oxides and hydroxides ---- thousand tons --	98	82	28	France 12; United Kingdom 10; United States 9.
Salt ---- do ----	961	945	464	Belgium-Luxembourg 428; Sweden 209; Denmark 130.
Sodium and potassium compounds, n.e.s.:				
Caustic soda ---- do ----	120	184	81	Netherlands 63; Brazil 20.
Caustic potash and peroxides of sodium potassium	12,369	11,485	1,350	U.S.S.R. 3,300; United States 1,401; Switzerland 1,218.
Stone, sand and gravel, n.e.s.:				
Dimension stone:				
Unworked and partly worked:				
Marble and other calcareous -- thousand tons --	7	3	2	Netherlands 1; Switzerland 1.
Slate ---- do ----	157	140	132	Netherlands 129.
Granite, porphyry, other ---- do ----	398	365	353	Netherlands 325.
Worked all types including paving blocks --- do ----	32	33	30	Netherlands 20; Belgium-Luxembourg 9.
Gravel and crushed rock, including macadam --- do ----	7,484	9,327	8,410	Netherlands 6,164; Belgium-Luxembourg 2,216.
Quartz and quartizite, crude and partly worked. ---- do ----	54	41	20	Austria 13; Italy 8; Belgium-Luxembourg 9.
Sand, excluding metal-bearing ---- do ----	2,316	4,624	4,295	Netherlands 3,888; Belgium-Luxembourg 287.
Sulfur and pyrite:				
Pyrite	82	267	79	France 74; United Kingdom 43.
Elemental, excluding colloidal and precipitated	25,883	66,377	3,363	Austria 7,820; Hungary 6,885; India 6,753.
Other elemental	1,219	1,156	164	United Kingdom 165; Sweden 126.
Sulfur dioxide	2,198	2,809	549	Sweden 1,165; Austria 789.
Sulfuric acid	50,893	97,586	40,043	United Kingdom 43,575; Netherlands 34,772.
Talc, soapstone, steatite	1,220	1,146	191	Switzerland 351; Sweden 210.
Vermiculite, and mineral wool	14,202	96	25	NA.
Other nonmetallic materials:				
Bromine, fluorine, iodine in pure form	427	725	93	Japan 277; Chile 136; Israel 117.
Meerschaum, amber, jet	1	---------	--------	
Slag and other nonmetalliferous waste from metallurgical operations:				
Derived from iron and steel manufacture. thousand tons --	1,171	592	586	Netherlands 269; France 240.
Other ---- do ----	362	164	154	Netherlands 109; France 40.

See footnotes at end of table.

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Table 4.—Federal Republic of Germany: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	1966 destinations	
			EEC [1]	Principal destinations
Mineral fuels:				
Asphalt and bitumen, natural	1,653	861	322	Austria 358.
Coal, coke, briquets:				
Anthracite and bituminous coal—thousand tons	13,300	15,797	15,014	France 6,015; Netherlands 3,429.
Bituminous coal briquets—do	277	218	196	Italy 69; France 53; Netherlands 41.
Lignite and lignite briquets—do	1,342	1,234	941	France 359; Netherlands 246; Austria 176.
Peat and peat briquets—do	167	200	134	Netherlands 100; Switzerland 36.
Coke and semicoke from coal, peat, and lignite—do	9,759	8,309	6,175	Belgium-Luxembourg 3,042; France 2,702.
Carbon black	29,329	30,662	14,484	France 5,169; Belgium-Luxembourg 4,619; Austria 3,685; Netherlands 3,395.
Gas fuel, natural and manufactured—thousand tons	300	309	236	France 104; Netherlands 73; Denmark 63.
Hydrogen and rare gases	112	491	361	France 295; Belgium-Luxembourg 50.
Petroleum:				
Crude and partly refined oil—thousand tons	22	140	--------	Austria 128.
Refinery products:				
Gasoline—do	1,197	1,437	241	United Kingdom 248; Switzerland 310; Denmark 202.
Kerosine—do	383	517	6	Denmark 18; Switzerland 12; Bunkers 461.
Distillate fuel oil—do	1,003	1,086	136	Switzerland 482; Denmark 169; Bunkers 261.
Residual fuel oil—do	3,652	3,638	1,451	Netherlands 1,214; Switzerland 326; Bunkers 1,354.
Lubricants—do	124	170	69	United Kingdom 35; Netherlands 27; Belgium-Luxembourg 25.
Mineral jelly and wax—do	62	67	19	Italy 9; Netherlands 6; Denmark 6; Finland 6.
Nonlubricating oils, n.e.s.—do	77	82	38	United Kingdom 27; Belgium-Luxembourg 22.
Pitch and pitch coke—do	212	248	172	France 147; Spain 21; Netherlands 20.
Petroleum coke—do	164	153	94	Netherlands 46; France 35; Switzerland 20.
Bitumen and other residues—do	231	237	47	Switzerland 95; Netherlands 41; Denmark 39.
Bituminous mixtures, n.e.s—do	24	25	9	Denmark 10; Netherlands 6.
Tar, mineral, and other crude chemicals from coal, petroleum, and natural gas distillation, n.e.s.—do	162,655	156,132	84,180	Netherlands 39,406; United States 37,821; France 32,215.

r Revised. NA Not available.
[1] Belgium, France, Italy, Luxembourg, and the Netherlands.

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Table 5.—Federal Republic of Germany: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	1966 sources	
			EEC [1]	Principal sources
Metals:				
Aluminum:				
Bauxite—thousand tons	1,636	1,882	131	Yugoslavia 679; Greece 349; Australia 328.
Alumina	57,728	51,557	374	Guinea 45,499.
Aluminum hydroxide	818	1,325	986	United States 1,222.
Metal, including alloys:				
Scrap	58,662	50,848	16,011	United States 15,000; Netherlands 9,105; United Kingdom 5,138.
Ingots and equivalent forms	169,519	176,793	31,522	Norway 64,756; France 17,398.
Semimanufactures	32,668	38,625	29,953	Belgium-Luxembourg 12,842; France 8,798; Netherlands 6,102.
Antimony:				
Ore and concentrate	2,793	3,197	------	Thailand 1,702; Turkey 1,322.
Oxides	NA	591	199	U.S.S.R. 185; Belgium-Luxembourg 163; United Kingdom 156.
Metal, all forms	2,751	2,777	------	Mainland China 1,735; Czechoslovakia 646.
Arsenic anhydrides	1,308	------	------	
Bismuth metal, all forms	233	262	78	Netherlands 65; United Kingdom 51; mainland China 49.
Cadmium: Metal, all forms	1,196	1,149	593	Belgium-Luxembourg 339; Netherlands 190; Bulgaria 168.
Chromium:				
Chromite	305,560	308,328	187	U.S.S.R. 100,999; Republic of South Africa 98,929; Turkey 83,347.
Oxides and hydroxide	265	127	51	Netherlands 40; mainland China 32.
Metal, all forms—kilograms	70,800	41,700	17,000	France 17,000; Japan 12,200.
Cobalt:				
Oxides and hydroxides	263	320	303	Belgium-Luxembourg 303.
Metal, all forms	788	734	574	Belgium-Luxembourg 446; France 121.
Copper:				
Ore and concentrate	144,871	136,764	10,031	Nicaragua 44,258; Cyprus 39,096; Chile 25,978.
Matte	1,453	1,635	516	Czechoslavakia 1,005.
Scrap	109,104	78,306	41,470	Netherlands 16,372; France 16,049; Belgium-Luxembourg 8,862.
Blister	142,076	146,340	3,098	Zambia 44,463; Republic of South Africa 30,777; Chile 27,778.
Refined copper, unwrought	299,236	265,252	37,622	Chile 88,676; Zambia 50,566; Belgium-Luxembourg 33,349.
Copper alloys, unwrought	42,540	35,477	9,379	United Kingdom 14,227; Netherlands 3,509.
Master alloys	1,251	949	136	United Kingdom 568.
Semimanufactures, including alloys	72,673	56,794	35,714	Belgium-Luxembourg 18,554; Netherlands 7,692; France 5,929.
Gold and alloys:				
Unwrought—thousand troy ounces	3,930	3,850	188	U.S.S.R. 1,212; Republic of South Africa 1,199; Switzerland 898.
Semimanufactures—do	17	10	1	Switzerland 3; Austria 3; United States 3.
Iron and steel:				
Ore and concentrate:				
Iron ore—thousand tons	35,471	31,268	4,887	Sweden 9,576; Liberia 6,251; France 4,883.
Roasted pyrites—do	1,888	1,743	795	Spain 646; Italy 221; Belgium-Luxembourg 212.
Speigeleisen—do	10	10	10	France 9.
Pig iron, including cast iron—do	188	174	75	U.S.S.R. 37; France 33; Belgium-Luxembourg 25.
Powder and shot—do	18	17	6	Sweden 9; France 3.

See footnotes at end of table.

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Table 5.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	1966 sources	
			EEC [1]	Principal sources
Metals—Continued				
Iron and steel—Continued				
Ferroalloys:				
Ferromanganese—thousand tons	88	89	55	France 45; Norway 21.
Other—do	193	176	23	Norway 77; France 17.
Scrap—do	1,088	670	580	Belgium-Luxembourg 262; Netherlands 257.
Steel, primary forms:				
Ingots—do	4	20	5	Poland 15; Italy 4.
Blooms, billets and slabs—do	368	430	393	Belgium-Luxembourg 226; France 88; Netherlands 79.
Coil for rerolling—do	503	588	101	Austria 360; U.S.S.R. 116.
Semimanufactures:				
Wire rod—do	547	643	678	France 305; Belgium-Luxembourg 223.
Other bars and rods—do	733	860	746	Belgium-Luxembourg 330; Italy 212; France 131.
Sections:				
Large—do	339	364	339	Belgium-Luxembourg 198; France 115.
Small—do	206	213	182	Belgium-Luxembourg 102; France 54.
Plates and sheets:				
Heavy plates—do	548	471	336	Belgium-Luxembourg 234; France 71; Sweden 44.
Medium plates—do	219	180	158	Belgium-Luxembourg 110; France 39.
Thin, uncoated—do	1,326	1,232	1,111	France 507; Belgium-Luxembourg 366; Netherlands 145.
Coated:				
Tinned—do	99	110	110	France 56; Belgium-Luxembourg 44.
Other—do	77	82	77	Belgium-Luxembourg 46; France 31.
Hoop and strip—do	333	347	320	Belgium-Luxembourg 194; France 74; Netherlands 44.
Railway track material—do	21	13	11	Belgium-Luxembourg 9; Sweden 2; France 2.
Wire (excluding wire rod)—do	73	73	61	Belgium-Luxembourg 41; Netherlands 10.
Tubes, pipes and fittings—do	188	181	121	Netherlands 57; Belgium-Luxembourg 34; Italy 24.
Castings and forgings, rough—do	10	10	8	Belgium-Luxembourg 5.
Lead:				
Ore and concentrate	139,497	188,589	---	Canada 38,985; Sweden 36,520; Peru 25,762.
Oxides	3,727	2,817	726	Mexico 810; France 592.
Metal and alloys:				
Scrap	5,558	1,596	759	Belgium-Luxembourg 536; Czechoslovakia 466.
Unwrought	116,677	88,028	25,685	United Kingdom 21,528; Australia 14,995.
Semimanufactures	2,057	2,124	2,000	NA.
Magnesium:				
Oxide and hydroxide	2,115	2,077	614	Japan 1,319; Belgium-Luxembourg 345.
Scrap	552	207	40	Switzerland 82; Sweden 37.
Unwrought	40,494	35,654	2,499	Norway 21,214; United States 10,026.
Semimanufactures	256	162	7	Austria 133.
Manganese:				
Ores and concentrates—thousand tons	732	867	2	Republic of South Africa 369; Gabon 171.
Oxides	2,377	2,077	614	Japan 1,318; Belgium-Luxembourg 345.
Metal, all forms	2,418	1,860	762	France 762; Republic of South Africa 499.

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Mercury: Metal 76-pound flasks	22,974	19,464	2,176	Spain 11,458; Italy 2,176; Yugoslavia 1,798.
Molybdenum metal, all forms	316	387	59	U.S.S.R. 150; Austria 73.
Nickel:				
Ore and concentrate	530	5	NA	NA.
Matte and speiss	4,133	6,166	---	Canada 4,994.
Metal and alloys:				
Scrap	1,895	2,744	1,326	Netherlands 831; United States 549.
Unwrought	23,933	23,815	925	Canada 8,733; United Kingdom 7,911; Norway 5,085.
Semimanufactures	1,853	1,764	574	United Kingdom 521; France 306.
Platinum-group metals:				
Ashes, residues, scrap kilograms	49,300	86,809	42,679	Netherlands 26,033; Denmark 22,377; France 16,646.
Metals, all forms troy ounces	450,110	540,872	59,800	U.S.S.R. 291,736; United Kingdom 102,593; United States 56,875.
Radioactive and associated materials:				
Radioactive elements and isotopes and other compounds. kilograms	10,424	1,317	347	United States 663; Sweden 250.
Other isotopes do	392	1,137	14	United States 1,103.
Compounds of thorium, uranium, and rare-earth metals.	786	429	42	Austria 194; United States 110.
Silicon	19,051	18,982	8,220	France 4,996; Norway 4,124; Italy 3,200.
Silver:				
Silver-platinum ores and concentrates	r 653	---	---	
Ashes, residues, scrap kilograms	237,786	182,048	36,684	Sweden 69,952; Netherlands 36,059; Norway 31,777.
Unwrought including alloys thousand troy ounces	55,463	45,169	3,117	Mexico 18,398; Peru 9,217; Yugoslavia 3,153.
Semimanufactures including alloys do	3,327	953	110	Switzerland 621.
Tantalum metal, all forms kilograms	11,000	17,688	1,608	United States 10,194.
Tin:				
Ore and concentrate long tons	7,816	7,373	---	Bolivia 7,345.
Oxides do	206	138	137	Belgium-Luxembourg 89; France 48.
Metal and alloys:				
Scrap do	388	197	116	Netherlands 79; Switzerland 40.
Unwrought do	13,492	12,894	7,905	Netherlands 6,576; Malaysia 2,182.
Semimanufactures do	34	18	4	United States 11.
Titanium, vanadium, molybdenum, tantalum, and zirconium ores and concentrates.	447,426	409,707	812	Norway 225,093; Canada 127,124.
Titanium dioxide	1,812	3,121	2,755	Belgium-Luxembourg 1,306; Italy 712.
Tungsten:				
Ore and concentrate	6,120	5,312	16	Mainland China 2,767; U.S.S.R. 580; Bolivia 457.
Metal, all forms	449	529	79	Sweden 164; United States 118.
Uranium and thorium:				
Ores and concentrates	1,676	2,496	2,496	All from France.
Metal and alloys kilograms	12,100	17,600	15,700	Belgium-Luxembourg 15,700; United Kingdom 1,900.
Zinc and alloys:				
Ores and concentrates	120,747	164,682	6,687	Canada 56,087; Sweden 36,202; Peru 15,637.
Oxides	3,605	3,169	2,254	France 962; Netherlands 845.
Metal and alloys:				
Scrap	549	624	326	Sweden 194; Netherlands 160.
Zinc dust (blue powder)	5,468	4,474	3,664	Belgium-Luxembourg 3,653; Poland 550.
Unwrought	184,305	126,800	67,520	Belgium-Luxembourg 50,200; Netherlands 15,327.
Semimanufactures	15,847	14,468	6,408	Yugoslavia 7,324; Belgium-Luxembourg 4,367.
Zirconium metal, all forms kilograms	23,600	34,400	14,600	France 14,600; United States 14,300.

See footnotes at end of table.

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Table 5.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	1966 sources	
			EEC [1]	Principal sources
Metals—Continued				
Other:				
Nonferrous ores and concentrates	4,132	3,472	15	Thailand 1,702; Turkey 1,322.
Metalliferous nonferrous waste, n.e.s	92,057	88,490	30,679	Norway 13,658; Netherlands 11,588; France 7,089.
Oxides and hydroxides of barium and strontium.	2,164	76	12	United States 75.
Other inorganic bases, n.e.s	3,127	2,520	537	United States 1,096; United Kingdom 333.
Metals:				
Alkali, alkaline earth, and rare-earth metals	32	79	20	United States 45; France 20.
Arsenic and tellurium	53	51	11	Sweden 31; Belgium-Luxembourg 10.
Boron and nitrogen	r 31	21	21	Netherlands 20.
Columbium and tantalum metals, all forms	770	1,048	5	United States 498; Japan 411.
Phosphorus and selenium	2,333	2,435	20	United States 2,319.
Pyrophoric alloys	62	39	11	Austria 23; France 11.
Other	6	8	4	Netherlands 4; Finland 3.
Nonmetals:				
Abrasives:				
Natural:				
Industrial diamond—thousand carats	565	575	285	Belgium-Luxembourg 210; Republic of South Africa 180.
Dust and powder of gem stones, including diamond.—do	1,250	1,320	765	Netherlands 420; Belgium-Luxembourg 340; United Kingdom 200.
Diatomite and other siliceous earths	87,254	76,424	14,598	Denmark 54,649; France 14,509.
Pumice, emery, other natural abrasives	113,592	80,221	71,923	Italy 71,325.
Manufactured (grinding stone)	2,799	2,738	1,127	Austria 642; France 441; Sweden 336.
Artificial:				
Artificial corundum	4,619	6,743	3,010	France 2,775; Austria 2,383; United States 1,021.
Silicon carbide	6,504	8,122	1,271	Norway 6,288.
Asbestos:				
Crude or partially worked	173,473	169,414	13,655	Canada 82,745; U.S.S.R. 42,515.
Asbestos cement products	110,793	106,194	51,120	Belgium-Luxembourg 38,914; Sweden 21,333; Austria 10,512.
Asbestos manufactures, excluding friction materials.	8,356	7,726	2,688	United Kingdom 2,959; France 1,455; United States 1,330; Netherlands 1,036.
Barite and witherite	54,044	29,835	----------	NA.
Boron salts, natural	55,052	65,859	643	United States 59,937.
Boric oxide and acid	11,521	11,181	7,599	France 5,357; United States 3,512.
Cement, hydraulic—thousand tons	460	493	357	France 242; Belgium-Luxembourg 85; Switzerland 70.
Chalk—do	126	117	96	France 87; Denmark 20.
Clays and clay products:				
Crude:				
China clay (kaolin)—do	381	427	39	United Kingdom 306; France 39.
Fire clay—do	228	160	41	Czechoslovakia 59; Republic of South Africa 34; France 32.
Andalusite, dinas, other—do	252	224	149	Netherlands 77; France 48.

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Products: Construction materials:				
Building brick ---- do ----	507	500	396	Netherlands 354; Denmark 83.
Other (roof tile, ceramic piping, etc.) ---- do ----	235	258	182	Netherlands 76; Italy 66; Japan 35.
Refractory:				
Heat-insulating brick of diatomite and similar earths.	12,101	9,049	207	Denmark 8,505.
Brick, n.e.s.	64,141	51,745	NA	NA.
Mortars	16,904	18,740	4,043	Ireland 8,920; Austria 3,119; France 2,631.
Cryolite and chiolite	3,576	2,778	-------	Denmark 2,771.
Diamond and other gem stones:				
Diamond, except powder and dust:				
Other:				
Crude or rough cut ---- thousand carats ----	375	415	NA	NA.
Other worked ---- do ----	215	225	145	Belgium-Luxembourg 105; Israel 60.
Other precious or semiprecious:				
Crude or rough cut ---- kilograms ----	824,172	667,026	10	Brazil 564,469; Norway 98,600.
Other ---- do ----	2,932	2,125	151	Mainland China 750; Switzerland 274.
Dolomite ---- thousand tons ----	120	148	106	Belgium-Luxembourg 98; Austria 26.
Feldspar	51,206	52,977	24,734	Norway 16,600; Italy 14,891; France 9,736.
Fertilizer materials:				
Crude, natural:				
Phosphatic ---- thousand tons ----	2,521	2,506	---------	United States 1,062; U.S.S.R. 470; Morocco 413.
Nitrogenous (natural sodium nitrate)	8,120	6,018	---------	All from Chile.
Organic including guano	18,935	17,720	19,901	Netherlands 6,965; France 5,874; Peru 3,965.
Manufactured:				
Nitrogenous	158,079	236,743	213,601	Belgium-Luxembourg 193,948; Poland 21,825.
Phosphatic:				
Basic slag	529,082	586,057	552,369	Belgium-Luxembourg 548,617.
Other	24,069	18,383	15,619	Netherlands 12,388.
Potassic	49,145	37,618	33,835	France 33,643.
Other	16,078	19,023	17,402	France 15,879.
Fluorspar	110,846	120,342	57,593	France 52,931; Spain 33,604.
Graphite, natural crude or ground	17,729	14,513	110	Austria 7,311; Norway 1,951.
Gypsum and anhydrite	77,709	100,805	34,469	Austria 65,757; France 33,941.
Limestone and other calcareous stone, excluding dimension stone. ---- thousand tons ----	1,005	1,452	45	Austria 1,127; Sweden 240.
Lime, hydraulic or slaked	93,383	125,082	122,242	France 121,881.
Magnesite:				
Crude	3,066	1,142	559	Netherlands 559; Austria 410.
Caustic calcined	123,386	121,578	8,338	Austria 76,527.
Other sintered or fired	223,938	192,418	11,480	Austria 88,074; Czechoslovakia 56,332.
Magnesite, dolomite, chrome-magnesite refractories.	46,286	37,389	1,922	Austria 20,452; Norway 5,664.
Mica:				
Crude and scrap	6,856	5,477	494	India 2,238; United Kingdom 905.
Manufactures	204	150	80	Belgium-Luxembourg 43; France 37; United States 35.
Pigments, mineral	r 2,093	1,892	332	Austria 985; Sierra Leone 446.
Salt:				
Table	6,407	5,759	5,046	France 4,995.
Other	87,444	94,483	92,443	Netherlands 81,157.
Sodium and potassium compounds, n.e.s.:				
Caustic soda	76,097	59,682	56,468	Netherlands 51,159.
Caustic potash and peroxides of sodium and potassium.	4,022	9,339	9,081	Belgium-Luxembourg 8,989.

See footnotes at end of table.

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Table 5.—Federal Republic of Germany: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	1966 sources	
			EEC [1]	Principal sources
Nonmetals—Continued				
Stone, sand and gravel:				
Quartz and quartzite, crude, ground, and/or roughly squared.	51,091	44,981	17,626	Belgium-Luxembourg 15,439; Sweden 8,876.
Dimension stone:				
Crude or partly worked:				
Marble and other calcareous. thousand tons	192	140	81	Italy 59; Portugal 17; Greece 17.
Slate do	7	7	4	Norway 2; Italy 2.
Granite, sandstone, and other, n.e.s.	558	604	14	Sweden 240; Denmark 125; Austria 103.
Worked:				
Building and monumental. thousand tons	116	158	133	Italy 126.
Paving blocks and flagstones do	142	101	1	Portugal 78; Poland 13.
Slate do	15	13	11	Italy 9.
Gravel and crushed stone, including macadam. do	7,831	8,822	5,679	France 4,892; Denmark 2,049.
Sand, excluding metal-bearing do	1,513	1,890	1,764	France 1,163.
Sulfur, all forms:				
Pyrite do	1,548	1,440	---	Spain 581; Norway 435.
Elemental, excluding colloidal and precipitated. do	486	372	93	United States 274; France 93.
Elemental, colloidal, precipitated	150	344	142	United States 200; Italy 128.
Sulfur dioxide	573	227	---	All from Poland.
Sulfuric acid	219,532	107,996	100,331	France 46,243; Belgium-Luxembourg 29,779.
Mineral fuels:				
Asphalt and bitumen, natural	16,701	21,248	37	Trinidad 10,630; United States 10,437.
Carbon black	42,000	40,252	22,592	United States 15,895 Netherlands 9,790.
Coal, lignite, peat:				
Anthracite and bituminous thousand tons	7,166	6,782	772	United States 5,020; Poland 373; United Kingdom 458.
Bituminous briquets do	305	291	291	Netherlands 290.
Lignite and lignite briquets do	979	1,083	10	Czechoslovakia 1,064.
Peat and peat briquets do	12	22	17	Netherlands 16.
Coke, except petroleum coke do	627	507	361	Netherlands 284; Czechoslovakia 89.
Gas:				
Natural	66,488	83,276	79,478	Netherlands 58,227; France 21,071.
Manufactured	245	1,021	1,021	All from Netherlands.
Hydrogen and rare gases	59	172	130	France 116.
Petroleum:				
Crude, including shale oil thousand tons	59,068	67,686	---	Libya 26,330; Saudi Arabia 9,073; Iran 7,275.
Refinery products:				
Gasoline do	1,551	2,534	1,876	Netherlands 824; France 546; Italy 311.
Kerosine do	272	326	314	Belgium-Luxembourg 158; Netherlands 131.
Distillate fuels do	9,312	10,300	6,530	Netherlands 2,500; Italy 1,945; France 1,730.
Residual fuel oils do	3,383	3,089	2,061	France 1,203; Netherlands 498; Italy 333; Bunkers 378.

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Lubricants	do	199	198	103	Netherlands 49; United States 47; United Kingdom 31.
Mineral jelly and wax	do	51	54	9	United States 38; Netherlands 7.
Nonlubricating oils, n.e.s.	do	75	79	6	Venezuela 46; United States 14.
Pitch and pitch coke	do	35	30	4	Czechoslovakia 22.
Petroleum coke	do	283	375	1	United States 359.
Petroleum and shale oil residues	do	497	544	492	Netherlands 281; France 157.
Bitumen and asphalt mixtures	do	15	18	13	Netherlands 11.
Tar, mineral, and other crude chemicals from coal, petroleum, and natural gas.		245,119	248,840	80,894	United Kingdom 47,061; Czechoslovakia 49,648; Netherlands 45,893.

r Revised. NA Not available.
1 Belgium, France, Italy, Luxembourg, and the Netherlands.

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COMMODITY REVIEW

METALS

Aluminum.—At the beginning of 1967, the country's production capacity for primary aluminum and alumina were 300,000 and 625,000 tons, respectively. Aluminum production increased at the rate of 3.6 percent, less than the 4.2 percent in 1966. Consumption fell, due chiefly to reduced demand for foundry products. Production of semimanufacturers rose 4 percent from 365,580 to 380,890 tons as the industry succeeded in increasing exports. Production of semifinished aluminum by type of products in 1967 was as follows in tons: Sheets, strip, discs, and slugs 225,372; rods and sections 89,524; pipe 14,336; wire 2,548; electrical conductors 41,508; drop and other forgings 7,602.

The supply position for primary and secondary aluminum in 1967 was as follows in tons:

Production of primary aluminum	253,000
Production of secondary aluminum	186,000
Imports of aluminum (ingot)	185,000
Exports of aluminum (ingot)	−22,000
Total available	602,000
Conversion of process scrap by secondary smelters and use of primary metal for secondary production	−18,000
Consumption	584,000

End users of aluminum (both primary and secondary) and their respective shares of consumption in percent were as follows: Transportation 24.1; machinery 9.9; electrotechnology 13.8 (6.4 percent for conductors); construction 9.9; packaging 8.4; iron and steel 3.9; metal wares 3.3; exports 13.8; household 2.9; miscellaneous 10. The price of aluminum remained steady at $552 per ton.

The Goettingen aluminum rolling mill of Alcan was expanded to 30,000 tons per year. The Norf plant of Vereinigte-Aluminium-Werke AG (VDM) and Alcan (200,000-ton annual capacity) came into operation. Metallgesellschaft, VDM, and Alusuisse combined in establishing Leichtmetal GmbH which contracted with Rheinisch-Westfaelisches Elektrizitaetswerk AG for a billion kilowatt-hours of electricity for a 66,000-ton-per-year aluminum plant which will be erected in the Ruhr. Gebrueder Giulini GmbH, an important alumina producer (100,000-tons-per-year), will build a 22,000-ton-per-year aluminum plant at Ludwigshafen.

Iron Ore.—Domestic ore accounted for 8 percent of the contained iron consumed in the production of pig iron. The bulk of the roasted iron pyrite consumed was also of foreign origin.

During the year two additional iron mines closed and production of iron ore and employment at iron mines continued to decline. Salzgitter and Ilseder mines, which are linked to iron and steel plants, accounted for 43 and 21 percent of total mine run output. The Dogger ore deposits in Bavaria and Wuerttemberg States contributed an additional 11 percent. Information on the status of a deposit reported to be under development in 1965 at Salzgitter and Sulzbach-Rosenburg was not available.

Iron and Steel.—*Raw material consumption.* The large increase in pig iron production was reflected in the 5.6 percent rise in raw material consumption in 1967. Of all iron ore smelted, 66 percent was sintered. Consumption of iron bearing material per ton of pig iron declined by 37 kilograms but pig iron and scrap per ton of crude steel remained practically unchanged.

The iron and steel industry as a whole used 20.8 million tons of solid fuels, 2.9 million tons of liquid fuel, and 1,187,000 cubic meters of oxygen.

Production.—At the beginning of 1967, West Germany had an effective capacity to produce 35.8 million tons of pig iron and 48.4 million tons of crude steel; the latter was distributed by furnace type as follows in percent: Open hearth, 39; basic bessemer, 27; oxygen, 26; electric, 8; acid bessemer negligible (50,000 tons per year). Pig iron and steel output was at about 73 percent of capacity.

After 2 years of decline, production of pig iron, crude steel, and rolled steel increased by 7.7, 4.0, and 2.8 percent, respectively, in 1967. Pig iron output established a new peak with that for open

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Table 6.—Federal Republic of Germany: Raw materials consumed in the production of pig iron (Including feed to sintering plants)

(Thousand metric tons unless otherwise specified)

Commodity	1965	1966	1967 p
Iron ore:			
Domestic	7,464	6,529	6,365
Imported	33,537	31,119	33,634
Total	41,001	37,648	39,999
Manganese ore	669	680	659
Pyrite cinder	3,542	3,692	4,240
Slags and plant scales	5,033	4,961	5,221
Blast furnace dust	2,191	1,719	1,465
Scrap	685	641	542
Total metallic raw materials:			
Gross weight	53,121	49,340	52,125
Iron content:			
Iron ore:			
Domestic	2,382	2,052	2,027
Imported	18,118	17,092	18,805
Manganese ore	75	69	86
Pyrite cinder	1,752	1,806	2,070
Slags and plant scales	2,231	2,211	2,333
Blast furnace dust	842	651	542
Scrap	571	544	457
Total iron content	25,971	24,426	26,320
Limestone	3,052	2,720	2,982
Per ton of product	113	107	109
Phosphate	419	303	192
Total gross weight of metallic raw materials, limestone, and phosphate	56,592	52,363	55,300
Coke	18,127	15,796	16,516

p Preliminary.

Table 7.—Federal Republic of Germany: Scrap supply and consumption

(Thousand metric tons)

	1965	1966	1967
Source:			
Iron and steel plants	9,585	9,152	9,075
Foundries	2,589	2,328	2,135
Purchases:			
Domestic	6,332	6,272	6,254
Imported	1,066	638	1,078
Other, including variation in stock estimates	2,707	2,655	2,654
Total, new supply	22,279	21,045	21,196
Consumption:			
Iron and steel plants	15,337	14,825	15,290
Iron and steel foundries	5,049	4,515	4,054
Consigned for export	1,933	2,011	2,092
Stocks at yearend	2,294	1,989	1,750

hearth furnaces increasing 23.6 percent and that from Thomas furnaces declining 1.6 percent.

Production of oxygen steel increased about 34 percent. Aside from 13.6 percent decline in basic bessemer steel production, there was little change in the output of other steel categories. Production of thin sheets, hot rolled wide strip, wire bars, railroad materials, and seamless tubes increased while bar and rod, hot rolled strip including skelp, thick, and medium sheets decreased.

Shipments.—Steel shipments consisted of 6,992,400 tons of semifinished steel for further inland processing (forging, hammering, etc.), 4,224,500 tons of hot rolled wide strip, and 22,352,000 tons of rolled steel, including tubes. The total of 33,568,900 tons was 354,000 tons more than in the previous year. For finished steel, flat products were 9.58 million tons (excluding 598,000 tons of galvanized and 606,600 tons of tinplate), and bars and

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Table 8.—Federal Republic of Germany: Salient statistics of the iron and steel industry

(Thousand metric tons unless otherwise specified)

	1965	1966	1967
PIG IRON			
Producing plants—number	35	33	30
Blast furnaces available—do	145	141	139
Blast furnaces in operation at yearend—do	104	86	91
Maximum production capacity	33,100	34,800	35,900
Production:			
Thomas	14,917	13,709	13,485
Open hearth	9,768	9,698	11,987
Foundry	453	304	249
Spiegeleisen and blast furnace ferromanganese	280	296	254
Other	1,572	1,406	1,391
Total	26,990	25,413	27,366
Blast furnace charge:			
Iron ore:			
Domestic	1,464	1,344	1,422
Iron content	552	502	528
Imported	13,020	10,801	12,262
Iron content	7,044	5,961	6,963
Sinter and briquets	29,908	29,103	30,602
Iron content	16,249	16,021	16,930
Manganese ore	603	595	580
Iron content	72	63	80
Other iron-bearing materials:			
Slag, scale, cinder, dust	3,534	3,234	3,217
Scrap	r 685	641	541
Limestone	1,678	1,396	1,344
Phosphate rock	401	286	190
Coke:			
Total	18,127	15,796	16,516
Kilograms per ton of pig iron produced	668	617	599
STEEL			
Converters:			
Basic bessemer:			
Total—number	58	58	54
In operation at end of year—do	50	49	44
Oxygen:			
Total—do	r 18	22	26
In operation at end of year—do	14	18	21
Furnaces:			
Open hearth:			
Total—do	182	173	150
In operation at end of year—do	119	93	96
Electric			
Total—do	185	190	189
In operation at end of year—do	164	165	166
Maximum production capacity (all furnaces)	44,635	47,580	48,400
Production of crude steel:			
Basic Bessemer	10,811	9,795	8,467
Oxygen	7,035	8,653	11,562
Open hearth	15,805	13,762	13,599
Electric	3,137	3,090	3,108
Other	33	15	8
Total	36,821	35,315	36,744
Ingots	36,171	34,738	36,218
Liquid steel for castings	650	577	526
Furnace feed for ingot steel:			
Pig iron:			
Total	r 24,634	23,605	24,717
Kilograms per ton crude steel	(681)	(680)	(682)
Scrap:			
Total	14,639	14,170	14,739
Kilograms per ton crude steel	(405)	(408)	(407)
Preblown Thomas and other premelted steels	121	95	62
Ferroalloys and alloying metals	268	274	284
Other iron bearing materials	824	776	847
Iron and manganese ores	977	797	846
Total iron bearing materials	41,463	39,717	41,495
Limestone	2,840	2,634	2,761

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Table 8.—Federal Republic of Germany: Salient statistics of the iron and steel industry—Continued

(Thousand metric tons unless otherwise specified)

	1965	1966	1967
CASTINGS			
Iron and steel foundries in operation—number	1,019	964	909
Production of iron and steel castings	4,464	3,915	3,579
Consumption of raw materials:			
Pig iron	1,867	1,594	1,455
Scrap	5,049	4,515	4,054
Ferroalloys and other metals	82	75	68
Total	6,998	6,184	5,577
EMPLOYMENT			
In coking plants of smelters—persons	1,976	2,427	2,237
Blast furnace, steel mills, hammer and forge shops—do	398,991	378,220	361,512
Foundries—do	176,158	157,301	144,821

Table 9.—Federal Republic of Germany: Production and consumption of sinter

(Thousand metric tons unless otherwise specified)

	1965	1966	1967
Production:			
Gross weight	29,912	29,081	30,669
Iron content	16,273	16,039	16,998
Consumption of raw materials:			
Iron ore	26,584	25,588	26,394
Cinder	3,461	3,603	4,184
Slags and scale	1,603	1,816	2,060
Blast furnace dust	2,168	1,717	1,465
Limestone	1,373	1,324	1,638
Iron content of materials consumed:			
Iron ore	12,908	12,686	13,347
Cinder	1,730	1,781	2,058
Slags and scale	832	954	1,086
Blast furnace dust	833	651	542
Total	16,303	16,072	17,033

Table 10.—Federal Republic of Germany: Production of finished steel

(Thousand tons)

	1965	1966	1967
Wire rods	2,868	2,674	2,844
Bars and rods	5,658	5,256	5,039
Angles, shapes, sections (excluding rails)	2,288	2,171	2,057
Universal plates	407	378	370
Other heavy plates and sheets (more than 4.75 millimeters thick)	3,688	3,594	3,445
Medium plates and sheets (3 to 4.75 millimeters)	531	518	459
Thin plates and sheets (less than 3 millimeters)	4,334	4,374	4,670
Hot rolled strip including skelp	2,249	2,349	2,253
Hot rolled wide strip	775	999	1,652
Rails and railway track material	443	432	514
Seamless steel tubes	1,596	1,500	1,619
Total finished steel	24,837	[1] 24,244	24,922
Selected semimanufactures:			
Tin plate	558	599	650
Galvanized and ternplate	447	623	700
Steel pipe welded	837	923	1,022
Extrusions and forgings	551	490	499
Steel castings	348	298	272

[1] Data do not add to total shown because of independent rounding.

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rods 4.95 million tons; wire rods were the next most important group with 2.67 million tons.

Copper.—Production of electrolytic copper increased, but that of fire-refined copper from scrap declined during the year. Semimanufacture output remained almost unchanged but castings declined. Copper consumption was estimated at 516,000 tons.

Copper prices varied greatly during the year from the $960 to $1,390 per ton of wire bar. Prices were 11 percent higher at yearend than on April 1, partly because of the U.S. copper strike.

In 1966 the Norddeutsche Affinerie celebrated its hundredth anniversary. The plant has an annual capacity of 200,000 tons of electrolytic copper and also produces antimony, bismuth, lead, nickel, tin, precious metals, metal powders, selenium, tellurium, and oxides and salts of all these metals. Byproducts include sulfuric acid, agricultural chemicals and pesticides, and ballast and construction materials from slags.

In September 1966 work started on adding an electrolytic copper refinery to the plant of the Berliner Kupfer-Raffinerie GmbH. This company produces about 1,200 to 1,500 tons of secondary copper per month.

Lead-Zinc.[4]—In 1967, West Germany produced 2.2 percent of the world's lead and 2.6 percent of zinc in ore, but its shares of world refined lead output was 8.6 percent and slab zinc 4.2 percent. One open pit and five underground mines were in operation. About 3,400 workers were employed in the lead-zinc mines including zinciferous pyrite mines.

Production of lead-zinc ores, including zinciferous pyrite, increased 3 percent to 2,814,000 tons. Zinc ore output attained a peak for the post-World War II period. Lead and zinc ores accounted for 47 and 45 percent of the material smelted in lead and zinc furnaces, respectively. Domestic ores supplied about 44 percent of primary lead and 80 percent of primary zinc.

Preliminary information indicates that 1967 consumption of lead, 256,800 tons, was practically the same as in 1966, but the 1967 zinc consumption of 302,700 tons was about 2.5 percent below that of the preceding year. Average price of lead, $225 per ton, was 14 percent lower than in 1966 and producer zinc price, $274, was 4 percent lower than in 1966.

Metallgesellschaft's subsidiary, Lurgi Gesellschaft fuer Chemie and Huettenwesen, was building an electrolytic zinc plant with an annual production capacity of 100,000 tons at Datteln in Westphalia. Production is expected at the end of 1968. A modern zinc rolling mill, with a 60,000-ton annual capacity, will come into operation in 1969.

Stollberger Zinc Aktiengesellschaft closed its zinc smelter at Muensterbusch in 1967. This smelter was the horizontal retort type and had 30,000 tons annual capacity. Preussag will also close its lead smelter (30,000 tons annual capacity) at Clausthal and its silver refinery at Lauthenthal and transfer the operations to the Goslar smelter of the Unterharzer Berg- und Huettenwerke GmbH which is now 100 percent owned by Preussag.

The contribution of the Meggen zinciferous pyrite mine to total zinc output increased further. Performance of this mine was as follows, in tons:

	1966	*1967*
Mine run ore	694,178	746,163
Marketable ore	595,496	647,831
Ore feed to flotation plant	511,780	567,849
Zinc-bearing concentrates produced	93,649	100,238
Lead-bearing concentrates produced	4,380	6,261

Precious Metals.—West Germany's consumption of gold, silver, and platinum was 4,694,000, 59,120,000, and 299,000 ounces, respectively. Domestic smelter output of silver was equivalent to about one-third of consumption. For the other metals, however, domestic output in terms of consumption was insignificant. Trade in these metals was approximately as follows, in thousand troy ounces:

	Imports	*Exports*
Gold	5,080	322
Silver	47,583	13,825
Platinum	311	9.6

[4] Fachvereinigung Metallerzbergbau e. V. Jahresbericht und Statistik, 1967, pp. 1–20.

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Tin.—Pertinent data on tin were as follows, in long tons:

Production:	
Primary	1,622
Secondary	845
Consumption (estimate)	11,000
Imports (primary and secondary)	11,149
Exports	1,377

Uranium.—Uranium reserves in West Germany may total 50 to 500 tons in the Ellweiller deposits and an additional 500 to 1,000 tons in Menzenschwand in the Black Forest. Uranium requirements up to 1980, when 25,000 magawatts of nuclear power may be in operation, are estimated at about 32,000 tons. To meet these needs, a company named Uran-Gesellschaft GmbH was formed by four firms. Uran-Gesellschaft will engage in prospecting, exploration, and exploitation of uranium and thorium deposits, as well as beneficiation and trade of thorium and uranium ores.

NONMETALS

The value of nonmetals producted in 1967, exclusive of building raw materials, totaled $171 million. Building raw materials (including pumice which is used principally as a building material) were valued at $678 million. Cement and clinker output was valued at an additional $470 million; however, some of the cement was produced from slag and not from quarry products. The monthly average index of production in the building industry in 1967 was 146.5 compared with 166.3 in 1966 and 161.2 in 1965 (1958=100).

Trade patterns for nonmetals have been the same with the country meeting its requirements for many industrial minerals (asbestos, magnesite, mica, and phosphates) by imports, and exporting barite, cement, refractory clays, and a few other commodities.

Cement.—Cement production declined because of reduced construction. In 1967, the country had an annual installed production capacity of 37 million tons of cement. Apparent consumption in this year was 30,289,000 tons or 506 kilograms per person. Cement prices declined slightly in 1967.

Fertilizers.—Production and shipment of the three types of fertilizers in West Germany in the fiscal year 1966–67 (June 30 to July 1) were as follows:[5]

	Production	Shipments	
		Domestic	Foreign
Nitrogeneous (N)	1,501,301	888,619	664,193
Phosphatic (P_2O_5)	947,882	800,935	225,388
Potassic (K_2O)	2,119,696	1,076,770	970,501

For the above period, production of primary nittrogen was 1,825,885 mostly as fertilizers, of which ammonium nitrate accounted for 49 percent; ammonium sulfate for 16 percent; calcium nitrate 7 percent; mixed fertilizers 26 percent; and other nitrates 2 percent. Nitrogen also was used to produce 405,141 tons of other chemical products.

Potash.—There was reportedly 14 potash mines and 13 potash works in operation in 1967, controlled by three operating groups: Wintershall A.G., Salzdetfurth A.G., and Kali-Chemie A.G.

Potash sales declined 4 percent in 1966 and continued down at least in the first half of 1967. Nonetheless, in view of the expected increase in world demand, the West German potash industry has plans to increase its production to 3 million tons of K_2O by the mid–1970's.

Potassic fertilizer shipped to the domestic market in the 1966–67 fertilizer year was 1,076,770 tons, down slightly from the previous year. Straight potash (single nutrient) fertilizer accounted for 54 percent of total shipments. Potash consumption per hectare is estimated at 80 kilograms.

Sulfur.—Domestic production of contained sulfur is estimated at 400,000 tons, of which 235,000 tons was from pyrite, 80,000 tons from coal oil and natural gas, and the remainder from other sources, mainly smelter gases. In 1966, Germany had a net import of the equivalent of 1,069,500 tons of sulfur and a production of 370,000 tons of sulfur equivalent; apparent consumption was about 1,440,000 tons of sulfur. Consumption in 1967 may

[5] Statistisches Bundesamt (Wiesbaden). Industrie und Handwerk (Industry and Handwork), Dungemittelversorgung (Fertilizer Supply). Reihe 9, Wirtschaftsjahr 1966–67, pp. 4, 8, and 10.

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have been below the figure because the sulfuric acid output of 3,084,000 tons (SO_3) was about 2 percent less than in 1966.

American Cyanamid Co. and Société Nationale des Pétroles d'Aquitaine carried out exploration for sulfur in northwest Germany at Suelfeld where three boreholes were deepened.

MINERAL FUELS

Energy consumption in West Germany in 1967 probably did not increase significantly above the 272 million tons of standard coal equivalent in 1966. The decline in the share of coal was 1.3 percent compared with 4.7 percent in 1966 as shown in the following tabulation:

Energy source	Percent of total primary energy consumption	
	1966	1967
Coal:		
Anthractie and bituminous	37.7	36.4
Lignite and pitch coal	10.4	11.1
Petroleum	46.2	46.3
Natural gas	1.5	2.2
Hydroelectric power	2.3	[1] 3.5
Other [1]	.8	
Net electricity imports	1.1	.5
Total	100.0	100.0

[1] Includes nuclear.

The increase in consumption was met by petroleum, natural gas, hydro-power, and nuclear power. It is estimated that 50 percent of energy requirements were met by imports.

Coal.—Coal output declined by 11 percent but stocks of coal at mines also declined to 14,097,000 tons at yearend 1967 from 15,199,000 tons at yearend 1966. Production days dropped from 255 to 239 days (235 days in the Ruhr). There was little change in relative shares of different coal ranks produced: 86.4 percent medium- to high-volatile coking coal (Flammkohle and Fettkohle); 5.0 percent bituminous and semianthracite (Esskohle and Magerkohle); and 8.6 percent semianthracite to anthracite.

Wages paid by the industry (excluding miners premium, separation allowance, and allowances for miners to travel home) totaled $634 million ($741 million in 1966 and $814 million in 1965). There were practically no wage increases during the year. In 1966, the production cost per net ton of coal was about $15.60 of which manpower accounted for 54.6 percent, materials including energy 34.9 percent, overhead and other costs 4.8 percent, and depreciation 5.7 percent. The overall production cost in 1967 may have been slightly lower. Average coal price at the mine in 1967 was about $16.75.

Productivity of German mines was the highest for West Europe, 5,542 kilograms per man-shift for the miner at the coal face in the Ruhr. Since 1960, the productivity at the Ruhr coal mines, which account for about 80 percent of total output, has increased at an average of 7.2 percent per year. In addition to greater mechanization, production is increasingly at fewer coal faces with better conditions and thicker seams. In 1966, there were 91 coal mining operations in all of West Germany compared with 173 in 1957, and in June 1967, 79 percent of the coal extracted was from fully mechanized mines. The research expenditure of the industry, exclusive of individual company expenditures, totaled $12.5 million. The industry was concentrating efforts on developing mining machines for difficult mining conditions.

During 1967 approximately 121 million tons of coal was available, consisting of production, withdrawals from stocks, and imports. This was 14 million tons less than in 1966, almost equal to the decline in production. After exports, about 102.4 million tons was available for domestic

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Table 11.—Federal Republic of Germany: Coal and lignite industry

(Production, productivity, and employment by district)

		1965	1966	1967
BITUMINOUS AND ANTHRACITE				
Production: [1]				
Ruhr	million tons	110.9	102.9	90.4
Saar	do.	14.2	13.7	12.4
Aachen	do.	7.8	7.4	7.0
Lower Saxony	do.	2.2	2.0	2.2
Total		135.1	126.0	112.0
Output per man-shift:				
Ruhr:				
Underground	kilograms	2,766	3,006	3,366
Total mining	do.	2,166	2,347	2,623
Saar:				
Underground	do.	2,740	2,960	3,198
Total mining	do.	2,215	2,379	2,586
Aachen:				
Underground	do.	2,139	2,213	2,487
Total mining	do.	1,728	1,799	2,000
Lower Saxony:				
Underground	do.	2,139	2,335	2,868
Total mining	do.	1,676	1,829	2,254
Federal Republic average:				
Underground	do.	2,705	2,926	3,264
Total mining	do.	2,130	2,299	2,561
Employment:				
Ruhr:				
Underground	thousand persons	181.0	160.5	133.3
Mine surface	do.	51.6	46.4	38.7
Cleaning	do.	22.4	21.6	19.1
Total including other workers and salaried employees	do.	316.1	287.0	243.5
Saar:				
Underground	do.	23.1	21.2	19.7
Mine surface	do.	5.7	5.5	4.7
Cleaning	do.	2.0	2.0	2.0
Total including other workers and salaried employees		39.6	36.9	33.8
Aachen:				
Underground	do.	16.0	15.1	13.4
Mine surface	do.	3.8	3.6	3.3
Cleaning	do.	1.0	1.0	1.0
Total including other workers and salaried employees	do.	25.2	24.1	22.0
Lower Saxony:				
Underground	do.	4.5	3.8	3.5
Mine surface	do.	1.2	1.0	.9
Cleaning	do.	.3	.3	.3
Total including other workers and salaried employees	do.	6.9	5.9	5.4
Federal Republic total:				
Underground	do.	224.5	200.6	169.9
Mine surface	do.	62.4	56.6	47.6
Cleaning	do.	25.7	24.8	22.4
Total including other workers and salaried employees	do.	387.7	353.9	304.8
LIGNITE AND SUBBITUMINOUS				
Production:				
Rhineland	million tons	86.5	83.6	83.0
Helmstedt, Hesse, and Bavaria	do.	15.4	14.5	13.8
Total		101.9	98.1	96.8
Employment:				
Rhineland:				
Open pit	thousand persons	10.1	9.8	8.3
All other	do.	12.3	12.0	11.7
Total	do.	22.4	21.8	20.0
Helmstedt, Hesse, and Bavaria	do.	11.0	10.4	9.1
Total	do.	33.4	32.2	29.1
PITCH COAL				
Production	million tons	1.7	1.2	.9
Employment	thousand persons	5.6	3.8	2.6

[1] Excludes small mines and leases.

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consumption which was distributed approximately as follows.

Coke ovens	40.9
Briquetting plants	3.5
Mine consumption	7.6
Electricity, other than used by mines	5.6
Subtotal	57.6
Sale to other end users: [1]	
Power plants	16.3
Industry, other than steel	10.6
Household	6.7
Gas	3.8
Transportation	2.7
Military	1.8
Iron and steel, other than coke	1.1
Subtotal	43.0
Other adjustment	1.3
Discrepancy	.5
Total	102.4

[1] Includes cool briquets.

Of the 1967 output, about 74 million tons were shipped for conversion to secondary forms. Sales to powerplants increased by about one-half million tons but declined to all other sectors. Colliery powerplants produced 24.9 billion kilowatt-hours, slightly more than 1966. This accounted for 13.4 percent of all generation and 17.1 billion kilowatt-hours were sold to other consumers.

Coke.—Coke production was almost 4.6 million tons less than in the previous year apparently because of smaller exports and lower coke consumption per unit of pig iron. Of the 35,245,000 tons produced, coal mines accounted for 30,652,000 tons and iron and steel plants for 4,593,000 tons.

Lignite (Braunkohle).—There was a further decline (1.4 percent) in lignite production in 1967, a trend which started in 1964. The decline was principally from mines in Helmstedt and Hessen; production in Bavaria increased while in the Rhineland, with almost 86 percent of output, production was fairly steady.

The 96,766,000-ton output was used as follows, in thousand tons:

Briquets	22,638
Soft coke and other	1,934
Mines own consumption	6,787
For electricity supplied to others	1,659
Available for sale:	
To public utilities (approximate)	58,700
To industry....do....	5,300

In 1967, 11,063,000 tons of lignite briquets were made and, used as follows, in thousand tons: Household and small consumers 8,581; exports 1,028; industry 1,135; mine consumption 248; and miscellaneous 71.

Petroleum.—Production of domestic petroleum increased 0.7 percent to 7.9 million tons or an average rate of 154,200 barrels per day. Most of the increase was from the Alpine Foreland. Consumption increased 4.5 percent to a total of 98.1 million tons. Nominal refinery throughput capacity increased by 20 million tons to 109 million tons; 1967 throughput was 79.5 million tons. In spite of the closure of the Suez Canal following the Near East crisis, West Germany's requirements were fully met and stocks of crude and products increased 20 percent to 12.7 million tons. However, the crisis caused increases in c.i.f. crude prices. Prices of gasoline and light and heavy heating oil at the gas station increased temporarily.

Excise taxes on petroleum products in 1967 are estimated at about $2.41 billion compared with $2 billion in 1966. In addition, taxes on motor vehicles in 1967 totaled $710 million.

Exploration.—Oil reserves on January 1, 1968, were estimated at 91.4 million tons (98.276 million tons on January 1, 1967), of which 69.3 million tons were in the proven category. Natural gas reserves on January 1, 1968, totaled 274 billion cubic meters, of which 202 billion were in the proven category.

There were no significant discoveries in the West German offshore area of the North Sea either in 1966 or 1967. By mid–1967, 10 wells had been drilled which were either dry holes or showed noncommercial gas. However, there were seven discovery wells inland.

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Table 12.—Federal Republic of Germany: Petroleum and natural gas production by areas

Area	1965	1966	1967
Petroleum, tons:			
North German basin:			
North of Elbe (Schleswig-Holstein)	853,217	858,184	887,305
Between Elbe and Weser (Hannover)	2,412,178	2,400,197	2,388,404
Between Weser and Ems	1,955,611	1,952,334	1,941,773
West of Ems (Emsland)	2,088,949	2,084,166	2,064,475
Upper Rhine Valley	233,992	197,211	201,854
Alpine Foreland (Bavaria)	339,946	376,125	443,382
Total	7,883,893	7,868,217	7,927,193
Natural gas, thousand cubic meters:			
Between Elbe and Weser (Hannover)	49,548	61,529	59,765
Between Weser and Ems	1,172,056	1,654,843	2,499,368
West of Ems (Emsland)	664,057	735,715	696,944
Upper Rhine Valley	62,252	63,963	58,803
Alpine Foreland (Bavaria)	272,814	298,803	398,883
Total	2,220,727	2,814,853	3,713,763

At the beginning of 1967, 43 drilling rigs were in operation. During the year, 230,772 meters of drilling was carried out (22 percent less than in 1966 when 295,572 meters was drilled) consisting of 90,416 meters of exploration, 82,626 meters of development, 48,705 meters deepening producing wells, and 9,025 meters of auxiliary drilling. Reduction in exploration drilling from 137,193 meters reflected the sharp decline in Federal support for exploration. Ninety-one wells were completed—32 exploration, 38 extensions, and 21 production wells. Of the exploration

Table 13.—Federal Republic of Germany: Shipments of petroleum products

(Thousand metric tons)

Commodity	1965	1966	1967
Domestic sale:			
Gasoline, all kinds	12,103	14,374	15,343
Kerosine including turbofuel	653	841	1,066
Diesel oil	7,315	7,874	7,710
Fuel oils	41,435	46,494	47,923
Liquefied petroleum gas	1,407	1,540	1,674
Lube oil and greases	836	845	795
Petroleum coke	349	455	390
Bitumen	3,528	3,872	3,936
Refinery gases	1,059	1,590	2,043
Other products	461	584	661
Total [1]	69,147	78,470	81,540
Consumed by refineries:			
Fuel oil	2,892	2,992	3,212
Refinery gas	1,555	1,594	1,790
Petroleum coke	214	208	221
Total	4,661	4,795	5,223
Bunker deliveries:			
Gas and diesel oil	661	787	745
Fuel oil	2,840	3,089	2,578
Lubricants	37	35	34
Total	[1] 3,537	3,911	3,357
Exports	5,145	5,531	6,352
Other shipments	1,040	1,062	1,068
Changes in refinery stock [2]	−201	742	1,050
Balancing factor [2] [3]	−186	−806	−2
Total products available	83,143	93,704	98,587

[1] Details do not add because of rounding.
[2] Plus denotes add; minus denotes substract.
[3] Apparently changes in nonrefinery stocks.

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wells, three discovered oil (all in the Alpine Foreland) and four discovered gas (two in the Weser-Ems area and two in the Alpine foothills). Of the 59 production and extension wells, 39 struck oil or gas.

Of the oil wells, Darching 1, located 30 kilometers southeast of Munich, was considered important. The other two, Wald 1 and Hosskirch were commercially less attractive. Darching 1 of DEA/Mobil/Gewerkschaft Elwerath discovered oil at a depth of 4,393 meters [6] in Eocene sandstone. Among the gas wells, Hesterberg Z1, between Weser and Ems and Rechtmehring 1 in the Alpine Foreland were the significant gas discoveries.

Consumption and Trade.—The total consumption (shipments) of 98.6 million tons comprised the following in million tons: Domestic sales 81.54; refineries own consumption 5.22; bunkers 3.36; and exports 6.35; the remainder was accounted for changes in refinery and nonrefinery stocks. Gasoline had the highest rate of increase (6.7 percent) in domestic sales, followed by middle distillates (4.1 percent) and heavy oil (0.2 percent). Actual inland consumption of the three categories were 12.2, 35.65, and 19.98 million tons, respectively, and the remainder was light fuel oils.

In 1967, Germany imported 72 million tons of crude oil valued at $1,164 million. Crude imports were 6.4 percent higher in tonnage than in 1966. Although import requirements were met, boycott action by a number of producing countries caused a shift in sources from Libya toward the Persian Gulf area.

Imports other than crude totaled 19,083,535 tons and consisted of 1,590,608 tons of partly refined crude; 16,747,367 tons of gasoline, middle and heavy distillates, and lubricants; and 745,650 tons of paraffins, solvents, waxes, vaselines, bitumens, asphalts, salvents, and similar non-fuel products.

Natural gas imports from the Netherlands rose from 50 million cubic meters in 1966 to 785 million cubic meters valued at $10.6 million. However, of the imports, 441 million cubic meters were accounted for by the West German share in the gas recovered on the Netherlands side of the Slochteren field.

West German exports of petroleum products increased 13.4 percent in volume to 8,035,100 tons (including 81,700 tons of crude oil) value at $175 million. Heavy fuel oil was the most important export item followed by gasoline.

As a result of the closure of the Suez Canal c.i.f. price of crude increased; some companies reported increases of $7.00 to $7.50 per ton. The mean price computed for all crude rose from $14.68 per ton in the first half of 1967 to $17.60 per ton in the second half of 1967. To pay for the extra freight cost, prices were increased in a number of steps by a total of about 5 cents per gallon for gasoline, 4.25 cents per gallon for light heating oil, and $2.50 per ton for heavy oil. These price increases were investigated by the Federal Cartel Office. By November, gasoline prices were reduced by approximately half of the original increase.

Refining.—Refinery output was equivalent to 97 percent of inland consumption and 80 percent of total consumption. Refinery expansion included the completion of three refineries at Vohburg by BP, at Burghausen by Marathon, and at Karenthal jointly by Saarbergwerke and French interests. The expansion of Shell's Godorf refinery add 4.3 million tons and the expansion of Esso's Karlsruhe refinery 4.5 million tons to the total. There were also increases in the capacities of the Raunheim, Neustadt, and Emden refineries. The output of the refineries was at 86 percent of the nominal capacity. The Marathon refinery produces primarily ethylene and acetylene and lesser quantities of fuel oil and coke. Products of the Klarenthal refinery are in percent: gas 3; naptha 26; middle distillates 38; and heavy fuel oil 33.

Projected refinery capacity is 147 million tons by 1975. Mobil Oil A.G. was building a refinery at Woerth on the Rhine, with 3.5 million tons throughput capacity, scheduled to go into operation in 1970. The crude oil will be obtained from the Transalpine Pipeline and the Rhine-Danube pipeline. The refinery will comprise a vacuum top distillation unit (3.5-million-ton capacity), a reformer (600,000 tons per year), a catalytic cracker (600,000 tons per year), a catalytic desulfurization unit, and a sulfur recovery unit of 25 tons per day capacity.

[6] Erdoel u. Koehle. V 21, January 1968, p. 47.

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Table 14.—Federal Republic of Germany: Nominal capacity of petroleum refineries on January 1, 1968

Company and location:	Throughput capacity (thousand tons per year)
BP Benzin-und Petroleum, AG.:	
Hamburg	4,300
Dinslaken	5,000
Vohburg	4,400
Caltex Deutschland, GmbH:	
Raunheim	4,000
Deutsche Erdoel, AG (DEA):	
Heide	3,000
DEA-Scholven GmbH:	
Karlsruhe	6,200
Deutsche Shell AG.:	
Hamburg-Harburg	4,300
Monheim	340
Godorf	8,300
Ingoldstadt	3,000
Elfmineraloel:	
Speyer	2,200
Erdoelwerk Frisia AG.:	
Emden	2,250
Erdoel Raffinerie Ingolstadt AG. (ENI):	
Ingolstadt	2,400
Erdoel Raffinerie Mannheim GmbH:	
Mannheim	2,500
Erdoel Raffinerie Neustadt GmbH:	
Neustadt/Danube	3,500
Esso AG.:	
Hamburg	3,600
Cologne	5,500
Karlsruhe	8,500
Ingolstadt	3,950
Gelsenberg-Benzin AG.:	
Gelsenkirchen-Horst	7,000
Gewerkschaft Erdoel Raffinerie:	
Deurag-Neurag, Misburg	2,550
Emsland, Lingen	3,750
Gewerkschaft-Julius Schindler:	
Hamburg	340
Kleinholz and Company:	
Essen	750
Marathon Chemische Werke AG.:	
Berghausen	2,000
Mineraloel und Asphaltwerke AG.:	
Ostermoor	550
Mineraloel Werke:	
Peine	18
Mobil Oil AG.:	
Bremen	1,800
Purfina Mineraloel-raffinerien:	
Duisburg	2,000
Muelheim	500
Ruhrchemie AG.:	
Oberhausen-Holten	550
Saarland Raffinerie:	
Klarenthal	1,250
Scholven-Chemie AG.:	
Gelsenkirchen-Buer	4,400
Union Rheinische Braunkohle-Kraftstoff AG.:	
Wesseling	4,000
Wintershall AG.:	
Salzbergen	335
Total	109,033

Source: Erodel und Kohle, V. 21, January 1968, p. 48.

Distribution of ownership of the refineries by principal companies at the end of 1967 was as follows, in percent: Esso 19.8; Shell 14.6; BP 12.6; Deutsche Erdoel AG 8.4; and Gelsenberg 6.4

Transportation.—During the year, West German refineries received 72.8 million tons of foreign crude oil—56.9 million tons through large crude oil pipelines and 15.9 million tons discharged directly at the processing plants located at ports or transported to inland refineries by inland waterway tankers or rail tank cars. The first crude piped through the Trans Alpine

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pipeline from Trieste, arrived in Ingolstadt in October. Breakdown of total crude oil receipts by ocean terminals was as follows, in percent: Wilhelmshaven 25.9; Marseilles 23.8; Rotterdam 20.7; Hamburg and Brunsbuettelkoog 17.1; Genoa 7.12; Emden 2.5; Trieste 1.96; and Bremen 1.35.

West Germany's tanker fleet at yearend totaled 2 million deadweight tons, adequate for supplying perhaps 30 percent of the country's petroleum requirements.

The first construction phase of the Brunsbuettelkoog deep water terminal, situated at the western entrance of the Kiel canal was completed during the year. The facilities can accommodate 65,000 ton tankers. The fairway, used by tankers going to the Wilhelmshaven terminal of the Northwest pipeline, was deepened to handle 120,000-ton tankers.

Pipelines under construction during the year were as follows:

1. A 36-inch 170-kilometer crude pipeline from Rotterdam to Duesseldorf, serving refineries in Cologne, Gelsenkirchen, and Raunheim;
2. A 16-inch 230-kilometer crude-product pipeline to the Klarenthal refinery near Saarbruecken from Rohwiller on the South European Pipeline from Marseilles;
3. A 16-inch 260-kilometer 4-million-ton-annual-capacity line from Ingolstadt to Eggolsheim, north northwest of Ingolstadt.

The Burghausen refinery is supplied by a 12-inch, 62-kilometer pipeline with a 3.25 million ton annual capacity. The pipeline starts at Steinhoering on the Trans Alpine Pipeline. The Klarenthal refinery is supplied by a 105-kilometer pipeline from Oberhoffen on the South European Pipeline.[7]

Distribution.—According to Erdoel Informationdienst, at the beginning of the year there were 46,262 gas stations in the country including West Berlin (42,865 in 1966). Classified by major brands, the total included 7,550 Aral; 6,360 Shell; 6,350 Esso; 4,880 BP; and 4,800 DEA. The increase in the number of gas stations (3 percent) was less than the 6-percent increase in sale of motor gasoline so that average sale per outlet increased.

Industry developments.—West German participation in foregin petroleum exploration has increased. German companies, alone or in association with others, held concessions in the Persian Gulf (Iran, Dubai, Muscat, and Oman), Algeria, Libya, Spain, Ethiopa, Morocco, Peru, Netherlands, and the United Kingdom. Oil production by West German companies abroad totaled about 3.5 million tons (2.2 million tons in 1966), of which 3.3 million tons was from Libya.

In October 1966, eight West German petroleum companies [8] formed a subsidiary, Deutsche Mineraloel-Explorationgesellschaft GmbH (Deminex), in which they pooled their resources for exploration outside West Germany. Collectively these companies own refining facilities with an annual throughput of 27 million tons and have 25 percent of the market but do not have adequate crude resources. Two of the large members of Deminex, Scholven-Chemie and Gelsenberg, were considering a merger. Deminex called for increased Government support, in way of tax adjustments (depletion allowance), more generous aid for exploration, and controls on supply of crude and products in lieu of a voluntary scheme of restraint.

Contental Oil Co. announced plans for the expansion of activities of its German subsidiary, Conoco Deutschland Inc., Hamburg. The company's gas stations, numbering 380, were slated to be increased. Continental has a 10-percent holding in the DEA-Scholven refinery at Karlsruhe and a 50-percent holding in Condea Petrochemie Gesellschraft, a petrochemical producer.

Natural Gas.—Natural gas reserves of West Germany on January 1, 1968 were estimated at 274,000 million cubic meters compared with a current annual demand of 3,400 million cubic meters. Reserves at end of 1966 totaled 241,000 million cubic meters, almost 75 times the production of that year. About 95 percent of the reserves are in Lower Saxony; most of the remainder are in Bavaria. Annual demand is expected to increase to 25,000 million cubic meters by 1975 of which 10,000 million cubic meters may be satisfied by indigenous sources. During the year the Bierwang gasfield, the largest in Bavaria, was put into production.

[7] Oil and Gas International. November 1967, p. 48.

[8] Gelsenkirchen Bergwerks AG, Scholven-Chemie AG, Wintershall AG, Preussag AG, Union Rheinische Braunkohlen-Kraftstoff AG, C. Deilmann Bergbau GmbH, Saarbergwerke AG, and Deutsche Schachtbau- und Tiefbohr GmbH.

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West German gasfields produced 3,714 million cubic meters of natural gas in 1966 (3,272 million cubic meters excluding natural gas from the Ems border estuary), an increase of 32 percent over the preceding year. An additional 624.3 million cubic meters of associated gas brought the total to 4,338 million cubic meters. The Weser-Ems region contributed 67 percent of the natural gas output (60 percent in 1966). Contributing to this increase were the recently developed Hengstlage and Doetlingen fields of the south Oldenburg area.

During the year, there were negotiations on arrangements to bring Dutch natural gas to southern Germany. These arrangements looked toward establishing a single purchasing company with participation of Gasversorgung Sueddeutschland.

Gas imports increased to 785.5 million cubic meters. An extension of the trunk gas pipeline from Arnhem was under construction; the extension will go to Cologne, Koblenz, Frankfurt, and Mannhein. Three companies were formed in 1967 to transport natural gas to these areas: Nordrheinische Erdgastransport, GmbH, Mittelrheinische Erdgastransport GmbH, and Sueddeutsche Erdgastransport. GmbH.

Supply of Dutch natural gas, contracted for in 1965 by Ruhrgas Aktiengesellschaft, started to flow in the completed section of the above line during the year. Deleveries of gas through the extended pipeline to various regional gas distributing groups (notably Ruhrgas and Thyssengas) are to reach 10,000 million cubic meters per year by 1975. Negotiations were carried out envisaging deliveries of Dutch natural gas to gas distributing groups operating further south. These negotiations looked toward establishing a single purchasing company with participation of Shell, Esso, and the following: Gasversorgung Sueddeutschland, a regional distribution company with a grid in Baden-Wuerttemberg; Bayerische Ferngas A.G., a distributing company in Bavaria; Saargas GmbH and Gasunion, Frankfurt. This large grouping would assure an adequate market for the gas.

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The Mineral Industry of Ghana

By Henry E. Stipp [1]

Ghana in 1967 continued to maintain its world position as a significant producer of gold, diamonds, manganese ore, and bauxite. In addition it became a potentially significant aluminum producer when the 103,000-ton-per-year Volta Aluminum Co., Ltd. (VALCO) smelter at Tema started producing at midyear. The value of mineral production (excluding petroleum refinery products) was estimated at more than $66 million [2] compared with about $65 million in 1966. The value of 1967 production was equivalent to about 3.7 percent of the gross national product of $1,800 million (current prices).

Gold, manganese ore, and diamond exports continued to provide a significant amount of foreign exchange. Employment by the minerals industry totaled 402 expatriates and 20,902 Africans in the fiscal year beginning April 1, 1966, including about 18,000 in the gold mining industry. In addition an estimated 6,000 African contract diggers worked Government-allotted diamond mining leases. The Government halted issuance of native digger licenses in late 1965 but instituted a new digger licensing system in March 1967. At yearend a new Board of Directors of the Ghanaian Diamond Marketing Board was inaugurated following expiration of the previous Board's term. Operations of the Board were being studied by a Government commission but by the close of 1967 changes recommended by the commission were not adopted.

PRODUCTION

Ghana's mineral commodity production consisted chiefly of gold, diamond, refined petroleum products, aluminum, manganese, and bauxite. Output of gold increased substantially although it remained below the 1963 peak. Ashanti Goldfields Corp., Ltd., experienced another good year, but the State Gold Mining Corp.'s output again declined as reserves were becoming depleted.

Diamond production decreased moderately despite the use of more efficient washing facilities by the largest producer Consolidated African Selection Trust, Ltd. A shortage of spare parts and replacement equipment caused by import licensing, hampered diamond mining operations. Individual digger output continued to drop as a result of Government restrictions introduced to combat diamond smuggling. New African digger licensing regulations introduced in early 1967 failed to stimulate digger output.

Manganese production dropped significantly, and reserves of high-grade ore reportedly were limited.

Bauxite mining continued satisfactorily at the Kanayerebo deposit, and preliminary work was carried out on the adjacent Ichiniso deposit to prepare it for production by late 1968. Limited production of aluminum began at midyear and by November had reached annual capacity of 103,000 tons. Output of iron and steel products increased as a result of greater efficiency in plant operation. Petroleum refinery output was down considerably from that of 1965, probably as a result of a change in the source of imported crude.

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from Ghanaian national currency to U.S. dollars at the following rates: For 1966 and preceding years—1 Ghana cedi=US$1.17; for 1967—1 new Ghana cedi=US$0.98.

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Table 1.—Ghana: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Aluminum					39,702
Bauxite	314,359	250,386	319,267	322,947	350,961
Gold—troy ounces	921,255	864,917	755,191	684,395	762,609
Iron and steel: Steel semimanufactures			e 8,000	e 8,000	e 12,000
Manganese ore	407,436	462,067	604,023	587,332	498,389
Silver (exports)—troy ounces	4,827				
Nonmetals:					
Diamond:					
Gem—thousand carats	r 4	r 378	r 25	282	254
Industrial—do	r 2,678	r 2,290	r 2,248	2,537	2,283
Total—do	r 2,682	2,668	r 2,273	2,819	2,537
Mineral fuels:					
Petroleum refinery products:					
Gasoline	35,303	154,465	141,766	NA	143,376
Kerosine and jet fuel	24,121	50,333	49,032	NA	89,277
Distillate fuel oil	65,833	268,032	262,306	NA	186,333
Residual fuel oil	62,023	263,444	245,542	NA	54,585
Other	28,685	1,437	1,805	NA	47,717
Total—do	215,965	737,711	700,451	NA	521,288

e Estimate. r Revised. NA Not available.

[1] In addition to commodities listed, cement production started in 1965, but output data are not available. Stone is also quarried; output average about 1.5 million cubic yards annually.

TRADE

Ghana's minerals and metals trade continued to have a favorable balance in 1965 and 1966; however, trade in all commodities displayed the usual unfavorable balance, as shown below:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities[1]	Total trade	
Exports:			
1965	64	319	20
1966	60	269	22
Imports:			
1965	60	451	13
1966	51	353	14
Trade balance:			
1965	+4	−132	XX
1966	+9	−84	XX

XX Not applicable.

[1] Values given are for those commodities listed in tables 2 and 3 of this chapter.

Source: Central Bureau of Statistics (Accra). External Trade Statistics of Ghana. V. 15, No. 12, December 1965, 279 pp. and v. 16, No. 12, December 1966, 265 pp.

Principal mineral commodity exports in 1966 were gold bullion valued at about $23.9 million, manganese ore valued at more than $17 million, and diamond valued at more than $15 million. The United Kingdom was the leading recipient accounting for about $33 million, followed by Belgium-Luxembourg (more than $6 million), and the United States (almost $3 million).

Ghanaian mineral commodity imports consisted chiefly of iron and steel products valued at $10.3 million, cement ($9.7 million), crude petroleum ($9.1 million), petroleum refinery products ($6.6 million), and aluminum and aluminum products ($6 million). The U.S.S.R. was the principal supplier on a value basis, providing mineral commodity imports valued at more than $16.4 million; other major suppliers were the United Kingdom ($10.6 million), the United States ($8.6 million), and West Germany ($2.5 million).

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Table 2.—Ghana: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Bauxite—thousand tons	r 282	311	All to United Kingdom.
Semimanufactures	13	8	All to Liberia.
Gold bullion—thousand troy ounces	783	690	All to United Kingdom.
Manganese ore—thousand tons	574	598	United States 247; Norway 207; Canada 105.
Scrap, nonferrous	1,041	944	Belgium-Luxembourg 372; United Kingdom 193; West Germany 147.
Nonmetals:			
Cement	146	4	All to United Kingdom.
Diamond—thousand carats	3,084	1,999	Belgium-Luxembourg 832; United Kingdon 799; Netherlands 217.
Mineral fuels:			
Petroleum:			
Crude and partially refined—thousand 42-gallon barrels	-----	57	All to Italy.
Refinery products:			
Gasoline—do	50	-----	
Kerosine—do	27	-----	
Distillate fuel oil—do	293	5	Nigeria 4; United Kingdom 1.
Residual fuel oil—do	1,260	1,415	All to Italy.
Other, mainly lubricants—do	36	-----	

r Revised.

Table 3.—Ghana: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys:			
Ingots	288	210	All from United Kingdom.
Semimanufactures	6,004	7,180	United Kingdom 3,537; United States 3,238.
Copper and alloys, semimanufactures	r 1,014	477	United Kingdom 393; United States 46.
Gold:			
Bullion—troy ounces	-------	NA	
Partly worked—do	1,904	NA	
Iron and steel:			
Pig iron and ferroalloys	357	1,299	United Kingdom 260; Norway 97.
Ingots and similar forms	3,148	332	All from United Kingdom.
Semimanufactures:			
Bars and rods	133,011	311,752	France 169,717; East Germany 130,973.
Angles, shapes and sections	2,644	2,930	United Kingdom 2,124; West Germany 409.
Plate, sheet, hoop and strip	15,057	9,329	United Kingdom 3,407; United States 2,028; Japan 1,211.
Rails and accessories	1,241	819	United Kingdom 637; Italy 152.
Wire	2,234	916	China, mainland 337; West Germany 262.
Tubes, pipes and fittings	19,564	14,259	United Kingdom 7,441; West Germany 3,428; Italy 1,789.
Castings and forgings	1,834	1,181	Italy 790; United Kingdom 311.
Total	179,090	342,817	
Lead:			
Ore and concentrates	21	-------	
Ingots and semimanufactures, including alloys	472	1,355	United Kingdom 1,234; Belgium-Luxembourg 100.
Silver, unworked and semiworked—troy ounces	176	NA	
Tin and alloys, ingots and semimanufactures	70	187	United Kingdom 123; West Germany 57.
Zinc and alloys, ingots and semimanufactures	1,046	323	Australia 203; Japan 101.
Metals, not elsewhere specified:			
Ore and concentrates (primarily manganese)	116	128	All from Nigeria.
Oxides, mainly for paint and other metallic compounds	685	22,710	United States 18,613; United Kingdom 3,295.
Scrap, nonferrous	20	NA	
Ingots and semimanufactures	7	7	All from United Kingdom.

See footnotes at end of table.

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Table 3.—Ghana: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals:			
Abrasives, natural	r 108	NA	
Cement thousand tons	525	536	U.S.S.R. 285; Poland 97; United Kingdom 71.
Clay	2,977	1,090	France 433; United Kingdom 285; Switzerland 221.
Clay, construction materials, brick, tile, etc.	18,517	8,310	United States 5,441; United Kingdom 2,071.
Fertilizer materials:			
Crude, all types	706	286	Nigeria 268.
Manufactured, all types	6,096	5,355	United Kingdom 3,245; West Germany 1,753.
Ammonium	45	180	West Germany 15.
Gypsum	4,650	2,581	All from France.
Lime	5,837	3,135	United Kingdom 2,356; West Germany 681.
Limestone	54,903	NA	
Salt	8,553	717	United Kingdom 269; West Germany 323.
Sodium and potassium compounds:			
Potash, caustic	15	NA	
Soda, caustic	2,190	3,459	United Kingdom 3,240; Italy 100.
Stone, sand and gravel:			
Dimension stone, worked	675	1,685	Italy 1,533.
Grinding stone and wheels	64	445	China, mainland 342.
Undifferentiated	r 2,448	6,531	West Germany 3,697; United States 1,855.
Sulfur in all forms:			
Crude	17	9	All from West Germany.
Sulfuric acid and other inorganic acids.	877	120	Yugoslavia 100; United Kingdom 12.
Nonmetals, not elsewhere specified:			
Chemicals, inorganic	527	157	United Kingdom 108; Nigeria 17.
Gases, hydrogen and other	65	120	United States 105; Nigeria 10.
Minerals, crude	1,198	3,231	United States 2,771; Norway 366.
Mineral fuels:			
Coal, coke, and briquets	27,753	53,377	Poland 30,091; United Kingdom 10,283; Nigeria 9,787.
Petroleum:[1] Crude thousand 42-gallon barrels	4,233	4,319	All from U.S.S.R.
Refinery products:			
Gasoline do	r 17	70	Italy 51; Netherlands Antilles 15.
Jet fuel and kerosine do	139	66	All from Ivory Coast.
Distillate fuel oil do	23	NA	
Residual fuel oil do	51	NA	
Lubricating oil do	148	77	United Kingdom 37; Nigeria 17; United States 14.
Other liquid products do	6	1	All from United States.
Total do	r 384	214	
Grease	1,002	81	West Germany 25; United Kingdom 24; France 23.
Other solid products	4,639	2,769	West Germany 1,039; Netherlands 293; United Kingdom 211.
Asphalt and bitumen	12,227	9,431	Yugoslavia 4,549; Netherlands Antilles 4,195.
Tar, pitch, and other crude chemicals from coal, oil, and gas.	221	625	United States 568; United Kingdom 50.

r Revised. NA Not available.
[1] Does not include small quantities of manufactured gas (liquefied petroleum gas), given only in terms of value.

COMMODITY REVIEW

METALS

Aluminum.—The Volta Aluminum Company, Ltd. (VALCO), a private Ghanaian firm financed by Kaiser Aluminum & Chemical Corp. (90 percent) and Reynolds Metal Co. (10 percent), began operation at midyear of the first potline (100 cells) of its 103,000-ton-per-year aluminum smelter at Tema. The first export shipment from Tema, more than 15,000 tons of ingots destined for the United Kingdom, was recorded in August [3], and by November, output had

[3] Overseas Review (London). Ghana. November 1967, p. 61.

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reached capacity level.[4] In 1967 the smelter used as raw material, alumina imported from the Western Hemisphere. Financial incentives have been offered to VALCO to use Ghanaian bauxite in its smelter within a 10-year period, but to do so would require construction of an alumina plant in Ghana at a cost of about $90 million. VALCO was scheduled to purchase 300,000 kilowatts of electric power from the Volta River Authority plant at Akosombo, at a cost of about $2 million annually.

The Ghana Pioneer Aluminum Company, Ltd., planned to establish a rolling mill at Tema by yearend 1967 [5] that reportedly will use ingots produced by VALCO. Ghana Pioneer has received orders valued at $14 million for cooking utensils and cutlery from Togo, Dahomey, Liberia, Ivory Coast, Upper Volta, and Nigeria.

Bauxite.—The Ghanaian Geology Survey has estimated that bauxite deposits in the Eastern, Western, and Ashanti regions may total 400 million tons.[6] In 1967, British Aluminum Co., Ltd. (BAL), was exploiting a deposit at Kanayerebo near Awaso, and in 1966 produced and exported 322,932 tons to their alumina plant in Burntisland, Scotland. The country's largest deposit, at Aya-Yenahin near Kumasi, reportedly was not being worked because of inadequate transportation. Ghanaian bauxite ore is of low grade (38 to 52 percent aluminum oxide) compared with ore from Guinea's Boke deposit which contains 54 percent aluminum oxide.

Gold.—Ashanti Goldfields Corp. Ltd., proved 1,220 feet of gold bearing rock, with an average width of 8.2 feet.[7] The ore reportedly contained 5.45 troy ounces of gold per ton. The Government-operated Bibiani gold mine, 80 kilometers west of Kumasi, was scheduled to be closed. In calendar 1966 the mine recovered 19,568 troy ounces of gold from 130,208 tons of ore, averaging about 0.2 troy ounce per ton. Reserves at yearend 1965 were estimated at 387,135 metric tons. The mine employed 84 staff personnel and about 2,400 workers.

In 1967 the Board of Directors of the State Gold Mining Corp. was reconstituted.[8] This corporation and its predecessor Government agencies have been responsible for mine administration since 1961. The five gold mines under Government control have operated at a deficit of about $4.2 million annually; however the Government continues operating the mines despite the deficit in order to provide employment for large numbers of workers.

A National Liberation Council Decree was issued warning persons in possession or control of State Gold Mining Corp. property to inform the Corporation of their holdings. Failure to comply with the decree would subject the person, upon conviction, to a fine or imprisonment.[9] Under previous directors, corporation property was transferred from one site to another, sold, or lent, without records being kept, and it has been estimated that between 25 and 30 percent of the corporation's property could not be accounted for. In 1961 the value of plant equipment and minerals of the State Gold Mining Corp. was reported at $15.4 million.

Iron and Steel.—Output at the Tema Steelworks Corp. (formerly Kwame Nkrumah Steelworks Corp.) increased to 40 percent of its 30,480-ton annual capacity. Its product reportedly was comparable with the low-grade European steel imported by Ghana. In operation of the plant, important economies such as discontinuing the use of paper bags as slag containers, and the use of an ingot extruder to eliminate wear on molds, have been introduced. A team wage incentive plan was instituted in the melt shop and rolling mill to reward efficiency. A small foundry under construction will enable molds to be made in Ghana from imported pig iron and scrap molds, thus saving foreign exchange expended for finished molds imported from Europe. The steelworks also made plans to pay a higher price for locally purchased segregated scrap. At yearend 1967 the plant employed a general manager, five expatriate technicians, six Ghanaian supervisors, and 420 laborers.

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[4] U.S. Embassy, Accra, Ghana. State Department Airgram A-186, Dec. 3, 1967, p. 4.
[5] Overseas Review (London). June 1967, pp. 59, 65.
[6] Standard Bank Review (London). Smelting Aluminum in Ghana. February 1967, p. 4.
[7] U.S. Embassy, Accra, Ghana. State Department Airgram A-136, Oct. 3, 1967, p. 3.
[8] U.S. Embassy, Accra, Ghana. State Department Airgram A-200, Dec. 17, 1967, p. 5.
[9] U.S. Embassy, Accra, Ghana. State Department Airgram A-100, Sept. 10, 1967, p. 5.

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Manganese.—A battery manufacturing plant was scheduled for construction at Tema by Union Carbide Ghana, Ltd., a subsidiary of Union Carbide Corp. of the United States and the National Investment Bank of Accra.[10] The plant will use battery grade manganese ore produced at Nsuta by African Manganese Co., Ltd., another subsidiary of Union Carbide Corp. Annual output capacity of the plant was estimated at 30 million dry cell batteries.

The limited quantity of high-grade ore reserves remaining has led African Manganese Co., Ltd., to initiate studies of low-grade ore beneficiation methods in the hope of developing a means to economically exploit reportedly large reserves of such material.

NONMETALS

Cement.—A Norwegian concern, A and S Norway Cement Export, Ltd., and the Ghana Government agreed to form Ghana Cement Works, Ltd., to operate the cement clinker grinding plants established by the State Cement Works Corporation.[11]

The Government will hold 75 percent of the equity share capital, reportedly $2.8 million, and A and S Norway will manage the company and hold the remaining 25 percent interest. The cement factory at Tema that began producing 2 years ago supplied about 30 percent of domestic consumption.

Diamond.—During the Ghanaian fiscal year beginning April 1, 1966, diamond output totaled 2,599,638 carats compared with 2,999,006 carats in the previous fiscal year.[12] African diggers produced 38,965 carats and mining companies produced 2,560,673 carats during the year ending March 31, 1967. Consolidated African Selection Trust, Ltd. (CAST), recovered 2,449,000 carats in the fiscal year ending June 30, 1967. CAST completed an extension to the milling section of its concentrator in June 1966 to treat a larger volume of gravel. Expanded washing facilities at CAST mines have exceeded the input capacity of the concentrator. The company started a preliminary investigation of ground suitable for dredging operations.

A new system for licensing diamond diggers was announced early in 1967 by the Government Diamond Mining Corporation.[13] All diggers granted licenses will be required to sell their winnings to the Diamond Marketing Corporation. At midyear the tax on export of diamonds from Ghana was abolished in order to encourage the sale of stones in the official market. In November The Diamond Marketing Corp. published a paper describing the system under which diamonds are bought and sold in Ghana.[14] During 1966 the average number of persons employed in diamond mining was 3,848.

Limestone.—According to the agreement between the Ghanaian Government and A and S Norway Cement Export, Ltd., the company agreed to study the possibility of using limestone from the deposits at Nauli for producing cement clinker.[15]

MINERAL FUELS

Petroleum.—The Government proposed to divide imports of crude oil between the U.S.S.R. and the six companies that market refined products in Ghana.[16] More than 500,000 tons of crude were needed to supply the refinery at Tema from April through December. The U.S.S.R. had been shipping crude to the Ghana Supply Commission under a 2-year barter agreement. The six marketing companies proposed to supply crude directly to the refinery and purchase surplus heavy fuel oil from the refinery according to each company's share of the Ghanaian market for refined products. In August the oil product distributors reached agreement with the Government to supply Ghana's crude oil requirements for 6 months, starting September 1, 1967.

In October 1966 a team of 44 Rumanian and 15 Ghanaian technicians started drilling for oil at Atiavi in the Volta region.[17] Drilling also was started at Angola by a team of Rumanian tech-

[10] American Metal Market. Union Carbide Unit To Build New Plant. V. 74 No. 122, June 27, 1967, p. 20.
[11] Overseas Review (London). August 1967, p. 61.
[12] The Ghana Chamber of Mines (Accra). Fortieth Annual Report, 1st. April 1966 to 31st March 1967. Aug. 8, 1967, p.4.
[13] Standard Bank Review (London). April 1967, p. 13.
[14] The Diamond Marketing Corp. (Ghana). Diamond Marketing in Ghana. November 1967, 8 pp.
[15] Work cited in footnote 11.
[16] Petroleum Intelligence Weekly. Jan. 9, 1967. pp. 3, 4.
[17] Quarterly Economic Review (London). The Economist Intelligence Unit, No. 1, January 1967, p. 4.

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nicians. By July 1967 the well at Atiavi was drilling at 5,000 feet in hard basement type rock and the Angola well was at a depth of 2,000 feet in continental sedimentary rock. No significant discoveries of oil have been reported.

The Minerals Regulation of 1963 prohibited the holding of interests in the development of oil and gas deposits by any person who is not a citizen of Ghana.[18] Officials of the Ministry of Lands and Mineral Resources stated that the regulation would not be changed, but applications for exploration concessions would be accepted from non-Ghanaian companies. Concession areas for application cover the continental shelf and vary in size from 5,000 to 10,000 square miles. Some leading international oil companies were reported to be interested in an offshore area that the Ghanaian Government planned to open for bids.[19] No seismic surveys of the area have been made, but it was estimated that 80 percent had limited prospects, because of poor structural development. The Ghanaian Government has not indicated the terms it will require, but has published a brochure giving available geological information.

[18] U.S. Embassy, Accra, Ghana. State Department Airgram A–191, Dec. 7, 1967, p. 1.
[19] Petroleum Intelligence Weekly. Oct. 23, 1967, p. 5.

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The Mineral Industry of Greece

By Justin B. Gowen [1]

Preliminary figures for 1967 indicate a gross national product of somewhat more than $7 billion representing an increase of about 8 percent over 1966 at current prices. The output of mines and minerals based industries also showed a substantial increase, highlighted by the production of aluminum from Pechiney's new Aluminum de Grece plant which was reported to have attained capacity output in 1967. Increases were also shown in the output of zinc concentrates, and construction raw materials.

On December 28, 1967 the Greek Goverment announced a Five Year Plan to cover the period 1968–72. Emphasis of the new plan is on goals, among which are an annual average increase of 8 percent in the gross domestic product, a 73-percent increase in fixed investment over that of the 1961–66 period, and an increase of 7 percent per year in productivity. The total investment in mining during the new 5-year period is projected at $133 million, or 90 percent more than during 1962–66. The annual increase in output of the mining industry is projected at 10.9 percent.

PRODUCTION

In general, Greek production of minerals and metals was higher in 1967 than in the previous year. By far the most significant increase was registered in the output of aluminum metal as the new facilities operated for the first full year at near rated capacity. A sharp increase in the production of ferronickel was reported for 1967; however, nothing further is available regarding the operation of the plant of Larco Co., S.A., which went on stream in 1966. Production of manganese ore apparently continued to decline in 1967.

[1] Physical scientist, Division of International Activities.

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Table 1.—Greece: Production of metals and minerals

(Metric tons unless otherwise specified)

	1963	1964	1965	1966	1967 p
Metals:					
Aluminum:					
Alumina	------	------	------	73,000	NA
Bauxite thousand tons	1,277	r 1,047	r 1,270	1,200	1,500
Metal, primary	------	------	------	36,000	72,000
Semimanufactures	4,039	4,382	6,034	NA	NA
Chromite:					
Crude [1]	51,179	r 40,099	r 42,395	40,000	50,000
Concentrate	13,445	10,861	8,251	NA	NA
Copper and alloys:					
Copper, semimanufactures	1,293	1,022	3,812	NA	NA
Brass do	2,850	2,499	2,765	NA	NA
Iron and steel:					
Iron ore thousand tons	r 35	(r)	r 6	15	17
Pig iron and castings do	77	164	r 463	NA	NA
Steel, crude	209	210	210	210	160
Rolled products	r 170	r 248	r 271	r 315	380
Lead-zinc ores thousand tons	NA	NA	250	240	250
Lead:					
Ore, direct smelting oxidized	2,160	2,434	6,752	NA	NA
Concentrate	r 13,614	r 12,504	r 14,826	r 15,000	15,000
Metal content of concentrate	r 8,850	r 8,130	r 9,640	9,750	9,750
Base bullion, primary unrefined	r 4,000	5,000	5,200	5,500	5,500
Refined, primary and secondary	3,289	4,128	8,687	4,800	4,750
Semimanufactures	2,764	2,545	3,350	NA	NA
Manganese ore:					
Crude [2]	92,972	70,318	73,644	75,000	60,000
Concentrate	19,303	r 18,480	r 10,804	NA	15,000
Nickel:					
Ore	------	------	39,117	NA	NA
Ferronickel, 24 percent nickel	------	------	------	1,200	9,149
Silver thousand troy ounces	123	r 154	r 139	r 138	238
Zinc:					
Concentrate	23,967	19,903	20,340	15,000	20,000
Zinc content (estimate)	12,460	10,350	10,580	7,800	10,400
Nonmetals:					
Asbestos	67	r 63	(r)	(r)	------
Asbestos cement products	1,355	2,001	NA	NA	NA
Barite:					
Crude [3] thousand tons	r 145	r 119	r 131	130	150
Concentrate do	82	60	58	NA	NA
Bentonite do	r 35	r 99	50	90	120
Cement do	2,294	2,672	3,212	3,588	3,450
Emery	7,590	7,600	r 7,600	7,600	7,600
Fertilizers:					
Nitrogenous thousand tons	------	123	NA	223	700
Phosphatic do	r 158	r 168	r NA	549	
Composite and mixed do	167	203	NA	NA	NA
Gypsum do	r 85	r 141	100	120	150
Kaolin do	r 31	r 50	55	70	70
Magnesite:					
Crude do	r 267	r 360	r 315	375	425
Caustic calcined do	48	55	49	40	NA
Dead burnt do	42	47	64	70	NA
Marble thousand cubic meters	r 45	r 47	45	45	45
Perlite thousand metric tons	r 29	r 40	30	100	120
Pumice thousand tons	101	229	200	300	350
Pyrites do	113	r 115	r 104	135	180
Salt do	83	r 101	r 87	91	95
Santorin earth (pozzolan) do	238	r 314	400	350	500
Talc	2,744	r 3,764	3,500	3,500	5,000
Mineral fuels:					
Lignite thousand tons	r 3,526	r 3,859	r 5,080	r 4,840	5,000
Lignite briquets do	141	160	r 175	r 135	100
Manufactured gas million cubic meters	14	12	12	11	NA
Petroleum refinery products:					
Liquefied petroleum gases thousand tons	30	33	42	46	54
Aviation spirit do	r 24	r 31	r 32	r 167	266
Gasoline do	r 237	r 252	r 240	r 320	401
Kerosine do	r 142	r 145	r 133	r 154	104
Distillate fuels:					
Gas oil do	r 14	r 17	r 18	r 761	1,096
Diesel oil do	r 604	r 585	r 595		
Residual fuel oil do	r 703	r 710	r 687	r 1,365	1,704
Lubricants do	r 12	r 12	r 14	(r 4)	(4)
Asphalt and bitumen do	r 65	r 64	r 81	r 55	54
Other do	r 1	r 1	(r)	r 41	10
Total do	r 1,832	r 1,850	r 1,842	r 2,909	3,689
Refinery gas do	17	15	16	NA	NA

p Preliminary. r Revised. NA Not available.

[1] Includes some salable chromite in addition to concentrate derived from this crude.

[2] May contain some salable manganese ore in addition to concentrate derived from this crude.

[3] May contain some salable barite in addition to concentrate derived from this crude.

[4] Included with "Other."

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TRADE

Exports of mineral commodities from Greece in 1966 were valued at $52.2 million, representing an increase of nearly 63 percent over 1965. A large part of this increase (about 70 percent) was accounted for by the export of aluminum metal and semimanufactures from the new production facilities. Mineral commodity exports accounted for about 13 percent of Greece's gross exports, which increased from $327.8 million in 1965 to $406.0 million in 1966. The European Economic Community (EEC) was the most important area of destination, accounting for 50 percent of the mineral exports and 35 percent of the gross exports. The Federal Republic of Germany was Greece's most important individual customer, receiving about 17 percent of Greece's mineral exports and 20 percent of the total exports. The United States received 13 percent of the country's mineral exports and 10.5 percent of the gross exports.

The value of mineral imports declined from $223.9 million in 1965 to $220.7 million in 1966 while gross imports rose by about 8 percent to $1,222.9 million. The EEC was the most important supplier, both of mineral commodities (42 percent) and of total imports (41 percent). The Federal Republic was likewise the most important individual supplier, accounting for 13 percent of the minerals and 17 percent of the total. The United States supplied 1.5 percent of the minerals and about 11 percent of the total imports. Mineral trade compared with total commodity trade in 1965 and 1966 was as follows:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	32.2	327.8	9.8
1966	52.2	406.0	12.9
Imports:			
1965	223.9	1,133.7	19.7
1966	220.7	1,222.9	18.0
Trade balance:			
1965	−191.7	−805.9	XX
1966	−168.5	−816.9	XX

XX Not applicable.

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Table 2.—Greece: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum and alloys:			
Bauxite—thousand tons	1,150	1,169	U.S.S.R. 425; West Germany 375; France 87.
Unwrought	------	27,580	France 13,307; United States 7,583; Belgium-Luxembourg 5,787.
Semimanufactures	433	1,369	Italy 714; Bulgaria 139; Cyprus 105.
Chromite	29,517	20,671	West Germany 11,481; France 7,360; Poland 1,830.
Copper and alloys:			
Copper matte	64	220	All to Belgium-Luxembourg.
Scrap	49	49	West Germany 37; United Kingdom 12.
Semimanufactures	1,337	1,166	South Viet-Nam 347; Netherlands 180; France 150; United States 129.
Iron and steel:			
Iron ore	4,480	------	
Roasted pyrites	25,036	32,533	West Germany 25,030; Netherlands 6,753.
Ingots and primary forms	17,793	20,154	Spain 10,496; Netherlands 9,652.
Semimanufactures:			
Bars, rods, and sections	15,928	5,454	Tunisia 2,995, Yugoslavia 2,459.
Plates and sheets	146	177	Yugoslavia 119.
Tubes, pipes, and fittings	1,394	447	Cyprus 436.
Lead: Ore and concentrate	10,438	10,250	West Germany 5,550; Italy 2,400; France 2,300.
Magnesium	32	------	
Manganese ore and concentrate	21,602	24,042	United States 18,280; West Germany 3,520; France 1,776.
Nickel and alloys, all forms	62	------	
Zinc:			
Ore and concentrate	23,982	20,738	West Germany 9,070; France 4,570; Belgium-Luxembourg 3,748; Spain 3,350.
Scrap	------	98	All to Belgium-Luxembourg.
Other nonferrous waste and scrap	1,515	1,724	Belgium-Luxembourg 1,050; Spain 447; West Germany 140.
Nonmetals:			
Abrasives:			
Emery, corundum, and other natural abrasives.	206,748	192,743	United States 168,223; Canada 14,500; West Germany 3,852.
Grinding stones	159	127	West Europe 106.
Barite and witherite	50,615	48,316	Libya 14,835; United States 10,160; Arab States not specified 11,455.
Cement	154,354	205,107	Libya 150,476, Cyprus 26,047; Spain 13,671; Aden 11,524.
Clay and refractory materials:			
Clay	125,974	99,599	France 48,071; Libya 18,418; Rumania 6,152.
Brick and tile and refractory construction materials.	1,601	1,648	Libya 608; Cyprus 262; Syria 208; Spain 203.
Fertilizer, phosphatic (manufactured)	1,030	10,397	Bulgaria 10,248.
Magnesite	135,663	145,294	West Germany 35,983; Netherlands 24,520; United Kingdom 23,258; United States 21,065; Italy 13,377.
Pyrites, unroasted	7,860	6,030	All to Austria.
Stone and gravel:			
Dimension stone, rough cut	22,558	25,831	West Germany 16,041; Italy 5,218; Spain 1,015.
Building stone, unworked	208	118	NA.
Gravel and crushed stone	r 1,827	------	
Sulfur	14,607	20,686	Hungary 8,627; United Arab Republic 6,500; Yugoslavia 3,527.
Sulfuric acid	130	201	Mid-East.
Other organic acids	597	260	Do.
Inorganic bases	------	6,185	Lebanon 3,827; Australia 1,216; Spain 1,142.
Other nonmetallics:			
Slag, scale, and dross	------	2,726	West Germany 2,220; Israel 500.
Mineral substances, n.e.s	47,748	70,886	West Germany 27,315; United Kingdom 14,780; France 11,913; Belgium-Luxembourg 11,865.
Mineral fuels:			
Petroleum refinery products:			
Gasoline	------	9,019	Cyprus 8,395; Libya 615.
Kerosine	------	88,772	United Arab Republic 45,978; Lebanon 25,639; Libya 6,294; Cyprus 3,987.
Distillate fuels	627	20,500	Libya 8,683; Cyrpus 7,868; Liberia 956.
Residual fuel oil	2,288	26,845	Liberia 13,343; United States 6,500; Cyprus 2,315.
Lubricants	1,163	966	Lebanon 484; Israel 195; United Arab Republic 148; Bulgaria 124.
Nonchemical coal and petroleum wastes.	------	7,083	All to Bulgaria.

r Revised. NA Not available.

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Table 3.—Greece: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys:			
Bauxite	------	39,949	All from France.
Unwrought	8,582	6,509	Canada 2,516; Austria 1,413; France 559; Hungary 498.
Semimanufactures	2,476	1,519	France 604; West Germany 500.
Oxide and hydroxide	1,349	11,247	France 10,689.
Arsenic, acid	------	67	From Common Market countries. [1]
Chromium oxide and hydroxide	155	184	West Germany 160.
Copper and alloys:			
Blister	2,158	601	Congo (Kinshasa) 299; Rhodesia-Zambia 202; Tanganyika 100.
Refined	4,313	4,912	Rhodesia-Nyassaland 3,107; Congo, (Kinshasa) 1,519.
Semimanufactures	731	652	West Germany 245; Italy 86; United States 70.
Iron and steel:			
Iron ore	463,434	405,216	Tunisia 250,938; Liberia 145,174; Guiana 9,104.
Scrap	1,174	645	United Kingdom 330; Netherlands 211.
Spiegeleisen	150	215	Republic of South Africa 202.
Pig iron and castings	26,668	27,394	U.S.S.R. 9,951; West Germany 8,699; Bulgaria 8,533.
Powder, shot and grit	478	840	United Kingdom 488.
Ferromanganese	280	642	Republic of South Africa 326; Norway 215.
Other ferroalloys	1,168	1,308	Republic of South Africa 765.
Primary forms—thousand tons	72	81	West Germany 35; Belgium-Luxembourg 22; France 17.
Semimanufactures:			
Bars, rods and sections—do	149	167	Belgium-Luxembourg 47; West Germany 44; France 34; Italy 14; Czechoslovakia 12.
Plates and sheets—do	128	149	West Germany 33; United Kingdom 31; Belgium-Luxembourg 24; Italy 19; France 15; Austria 13.
Hoop and strip—do	58	75	Belgium-Luxembourg 35; West Germany 17; Italy 12.
Railway track material—do	7	3	France 2.
Tubes, pipes and fittings—do	21	17	West Germany 8; Japan 2; Italy 1.
Castings and forgings—do	1	1	NA.
Iron oxides and hydroxide	700	950	West Germany 857.
Lead and alloys:			
Ore and concentrate	6,932	7,064	Morocco 6,044; Algeria 1,020.
Unwrought	983	2,688	Canada 1,021; United Kingdom 588; Mexico 455.
Semimanufactures	350	106	Netherlands 56; United Kingdom 20.
Lead oxide	482	967	France 759; West Germany 187.
Mercury—76-pound flasks	58	1,073	United States 696; Italy 232; Mexico 116.
Molybdenum, all forms—kilograms	454	1,000	Mainly from Netherlands.
Nickel, semimanufactures	65	61	United Kingdom 26; West Germany 22.
Silver, unwrought and semi-manufactures. troy ounces	185,285	NA	
Platinum group metals—do	2,135	NA	
Tin, unwrought and long tons semi-manufactures.	244	260	Netherlands 100; Malaysia 88; Belgium-Luxembourg 31; United Kingdom 23.
Titanium oxide	1,778	2,116	West Germany 814; United Kingdom 655; Belgium-Luxembourg 228.
Tungsten, all forms—thousand dollars	$76	$98	West Germany $66; Sweden $15.
Zinc and alloys:			
Unwrought	5,582	7,942	Belgium-Luxembourg 3,426; Rhodesia-Zambia 1,561; West Germany 863; Japan 500.
Semimanufactures	219	224	Poland 148; West Germany 64.
Oxide	368	346	France 112; Netherlands 104; West Germany 64.
Other:			
Nonferrous ores and concentrates, n.e.s.	327	292	Australia 166.
Nonferrous metal scrap	------	127	NA.
Pyrophoric alloys	13	2	West Europe.
Alkali and rare earth metals	5	4	All from France.
Metalloids n.e.s	16	73	Nearly all from Common Market countries. [1]
Base metals n.e.s	217	59	Japan 23; China, mainland 17.

See footnotes at end of table.

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Table 3.—Greece: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals:			
Abrasives:			
Diatomite	460	1,430	Yugoslavia 1,202; Italy 129.
Other	19	32	Mainly from West Europe.
Grinding stones	287	256	Italy 76; Austria 63; West Germany 34.
Asbestos, crude	4,468	3,911	Canada 2,102; Republic of South Africa 1,316; U.S.S.R. 440.
Asbestos cement products	3,415	3,086	Yugoslavia 1,380; Czechoslovakia 1,004; Italy 256.
Cement	1,492	1,359	Denmark 891; France 391.
Clay, refractory, crude	11,085	17,933	United Kingdom 11,044; West Germany 2,525; Belgium-Luxembourg 1,700; Czechoslovakia 1,340.
Clay and refractory construction materials.	30,025	28,721	West Germany 7,663; Italy 7,324; Israel 2,874; Austria 2,577.
Dolomite	253	144	West Europe.
Earth pigments	171	141	NA.
Feldspar and fluorspar	446	365	Mainly from Common Market countries.
Fertilizer materials:			
Natural:			
Natural sodium nitrate	4,161	7,978	Chile 7,780.
Phosphate rock. thousand tons	158	227	Morocco 110; Tunisia 71; Senegal 41.
Manufactured:			
Nitrogenous do	195	156	Italy 75; France 26; Norway 25.
Phosphatic do	60	21	Tunisia 12; Belgium-Luxembourg 9.
Potassic do	37	28	France 11; Italy 11.
Mixed do	84	52	Belgium-Luxembourg 31; Italy 10; United States 7.
Ammonia, anhydrous do	6	10	Spain 4; West Germany 2; Portugal 1.
Gem stones, synthetic kilograms	75	NA	
Graphite	369	294	West Germany 141.
Gypsum and plasters	375	412	West Germany 203.
Magnesite	504	340	Austria 289.
Mica, crude	22	30	NA.
Mica products	8	9	Belgium-Luxembourg 6.
Pyrites, unroasted	------	2,304	Cyprus 2,300.
Quartz, quartzite	417	289	West Europe.
Sodium and potassium compounds:			
Caustic soda	13,328	39,359	Italy 26,720; Netherlands 5,220; Yugoslavia 2,936; France 2,840.
Caustic potash	69	159	West Germany 87.
Stone, sand and gravel:			
Building stone	796	695	NA.
Sand	26,523	46,676	Belgium-Luxembourg 42,467.
Gravel and crushed stone	317	230	West Europe 221.
Sulfur and sulfuric acid:			
Sulfur, crude	37,343	48,514	France 37,818; Canada 10,589.
Sulfur, precipitated or sublimed	10,718	10,436	Canada 10,371.
Sulfuric acid, oleum	61,487	39,393	Italy 23,278; Bulgaria 16,074.
Talc	69	182	Italy 124.
Other:			
Crude nonmetals, n.e.s	175	258	France 135.
Oxides of strontium, barium and magnesium.	35	38	Mainly from West Europe.
Other inorganic bases, n.e.s	15	35	Norway 12; Other West Europe 17.
Hydrogen and rare gases	148	145	Italy 92; Norway 26; Sweden 15.
Halogens, excluding chlorine	30	5	NA.
Mineral construction materials, n.e.s.	393	461	Austria 200; Netherlands 150; Belgium-Luxembourg 40.
Mineral fuels:			
Carbon black	885	1,081	Italy 698; United States 316.
Coal and briquets thousand tons	200	136	Poland 54; U.S.S.R. 53; Turkey 14.
Coke do	230	262	Czechoslovakia 114; West Germany 96; Italy 22; Norway 22.
Gas, natural	3,592	4,699	All from Italy.
Petroleum:			
Crude thousand tons	2,590	3,113	Saudi Arabia 1,897; Iran 728; U.S.S.R. 448; Italy 40.
Refinery products:			
Gasoline do	116	166	United Arab Republic 61; U.S.S.R. 60; Rumania 34.
Kerosine do	7	7	Italy 4; Netherlands Antilles 2.
Distillate fuels do	637	478	U.S.S.R. 129; Rumania 90; United Arab Republic 89; Italy 84.
Residual fuel oils do	1,373	818	U.S.S.R. 276; United Arab Republic 172; Italy 124.
Lubricants do	39	38	France 11; Netherlands 9; United Kingdom 6; United States 2.
Petroleum coke	6	11	United States 6; France 5.
Other do	10	6	West Germany 2; France 1; Netherlands 1.

[1] Belgium, Federal Republic of Germany, France, Italy, Luxembourg, and the Netherlands.

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COMMODITY REVIEW

Aluminum.—The production facilities of Aluminum de Grece are situated at Aspra Spitia on Antikyra Bay of the Gulf of Corinth near Distomon about 100 kilometers northeast of Athens. The works, a controlling interest of which is owned by Péchiney, Compagnie de Produits Chimiques et Electrometállurgiques, of France, comprises an alumina plant (capacity 200,000 tons annually); an electrolytic reduction plant (capacity 72,000 tons of aluminum annually); and an electrode plant (capacity 30,000 tons of prebaked electrodes annually). In August 1967, plans were announced by Péchiney to expand the alumina facilities for an additional 250,000 tons annually, and to include a thermal powerplant to avoid any additional load on the Public Power Corp. facilities which supply the present plant.

Bauxite is supplied by mines of the nearby Mount Parnassas region. Companies owning 19 mines in this district recently merged to form the Distomon Hellenic Bauxite Co.

Aluminum semimanufactures are produced by Viohalco Aluminum S.A. formed in 1965 to supplement the parent company's ("Viohalco" Industrie du Ciuvre et de Aluminum S.A.) copper and brass rolling mills in Athens.

Iron and Steel.—The decline in crude steel output in 1967 was generally attributed to lack of capacity for processing steel billets, which are produced at Halyvourgiki where additional hot rolling facilities were under construction at the end of 1967.

Greece's basic iron and steel industry at the end of 1967 consisted of the integrated works of Halyvourgiki Inc. at Eleusis, near Athens, and a cold sheet rolling mill forming the first unit of a planned integrated steel works of the Hellenic Steel Co. at Thessaloniki. Halyvourgiki's works comprised two blast furnaces each with an integrated 35-ton Linz-Donawitz oxygen steel converter; a continuous casting machine for billets; concrete bar, section, and wire rod mills; and a wire drawing section. Under construction was a hot rolling mill for the production of sheet coils, heavy plate for shipbuilding, and sections for construction. The annual capacity of the Halyvourgiki works was reported in metric tons as follows; Pig iron, 500,000; crude steel, 400,000 to 500,000 ingot tons; rolled products, 500,000 tons.

Although it was reported in 1967 that Halyvourgiki would supply coils for Hellenic Steel's cold mill, it was later reported, early in 1968, that Hellenic had arranged for financing the construction of a hot mill at Thessaloniki scheduled to go into production during 1969.

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The Mineral Industry of Guyana

By F. W. Wessel [1]

Bauxite continued to be Guyana's most significant mineral product and a major export item. Crude bauxite production continued to increase, having gained 42 percent since 1963, while dried bauxite exports have nearly doubled in the same period. The industry invested $39 million [2] in new equipment and facilities during 1966 and 1967. The beneficial effect of an aluminum smelter on the foreign trade balance of neighboring Surinam has not gone unnoticed in Guyana, where establishment of facilities for aluminum production remained a major point of government policy.

Production of manganese ore continued at a high level during 1967; but there were indications of gradually declining grade of this material, which is already low-grade enough to make competition for world markets difficult.

Prospecting for petroleum continued during the year, in spite of apparently negative results to date. New petroleum regulations were issued in April, replacing the code of 1940, as amended. The new code will regulate prospecting for oil in Guyana's interior as well as the coastal activity, covered by earlier rules.

The portion of Guyana's 7-year (1966–72) development program devoted to minerals development during 1967 included active ground party examination of anomalies noted during the airborne surveys. The United Nations Special Fund sent personnel and allotted funds—$1.7 million over a 3-year period beginning in 1967, to which the Guyana Government has added $1.8 million.

The strongest anomalies recorded, when further investigated, frequently turned out to be graphitic schists or sediments. However, gold, copper, zinc, molybdenum, nickel, and iron mineralization has been noted, and intensive prospecting was conducted at selected localities.

Guyana's east and west borders both are contested. The dispute with Venezuela has been referred to the Mixed Boundary Commission. Pending a decision by that body, the Guyana Government rejected a Venezuelan offer for joint development of the disputed area. Similarly, a portion of the headwaters of the Courantyne River is claimed by both Guyana and Surinam. Mineral exploration in these areas by responsible companies is thus somewhat inhibited.

PRODUCTION

Bauxite and alumina dominated Guyana's mineral production again in 1967. In spite of adverse weather and labor trouble, production of crude bauxite slightly exceeded the record set in 1966. Production of dried bauxite for export was up 21 percent, but calcined bauxite declined 6½ percent and alumina 9½ percent in output.

Production of manganese ore was about the same as in 1966 while official figures for gold production showed a decline of 22 percent. However, because Guyana increased the cost of a gold-trading license from $20 to the range of $50 to $150, depending on location, it seems probable that gold production in 1967 was about the same as in 1966, but that some gold was being traded illegally, thus escaping statistical coverage. Similarly, the cost of a diamond buyer's license was increased from $75 to $350. Official figures show little change in diamond production over

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[2] All values are given in U.S. dollars.

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the past year; yet production in 1967 from a major find of industrial diamond is unofficially reported.[3]

There was no activity during the year in Guyana with reference to nickel, columbite, or iron ores. An application for permission to prospect for radioactive minerals was under consideration at yearend.

[3] Norwood, V.G.C. Guyana—an expanding source of industrial demands. Min. Mag. (London), v. 118, No. 3, March 1968, pp. 169, 171.

Table 1.—Guyana: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Aluminum:					
Bauxite:					
Crude ore [2]	2,379,883	r 2,517,934	2,918,693	r 3,357,741	3,381,169
Dried for export [3]	989,805	854,056	1,277,783	1,537,231	1,857,204
Calcined [4]	370,395	470,413	493,736	500,401	467,781
Alumina	225,650	296,255	279,070	301,719	273,227
Gold—troy ounces	r 2,848	2,111	2,077	3,045	2,379
Manganese ore and concentrate	142,728	118,757	168,861	e 180,000	179,552
Nonmetals:					
Diamond, all grades [5]—carats	99,748	109,682	112,874	r 98,887	97,352
Sand and gravel [6]	NA	NA	3,034	r 4,680	NA
Stone, crushed	11,892	NA	94,688	r 155,615	138,179

e Estimate. r Revised. NA Not available.

[1] In addition to the commodities tabulated, Guyana produces clay, sand and gravel, and additional quantities of stone, but quantitative data are not available.

[2] Production on which royalties were collected by the Government. Data apparently not corrected for free moisture content, which averages about 10 percent.

[3] Production data not available. Shipments for export used as best available measure of output.

[4] Figures represent weight of calcined product.

[5] Gem quality stones estimated at 55 to 60 percent of total production.

[6] Stone sand from Government quarries only.

TRADE

Official statistics on foreign trade continued to be incomplete during 1966 and 1967. Particular data not available include imports of base metals, phosphatic and potassic fertilizers, and some of the petroleum refinery products. However, enough data were available to show increases in general exports and imports of 11 and 13 percent, respectively, while the corresponding figures for increased trade in mineral commodities were 13 and 5 percent.

Comparative trade data for 1965 and 1966 are shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:[1]			
1965	45.184	95.505	47.3
1966	51.075	105.905	48.2
Imports:[2]			
1965	17.659	103.722	17.1
1966	18.509	117.163	15.8
Trade balance:			
1965	+27.525	−8.217	XX
1966	+32.566	−11.258	XX

XX Not Applicable.

[1] Excluding reexports.

[2] Partly estimated.

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A preliminary figure for the total value of mineral exports in 1967 was $43,666,000, the decline reflecting devaluation of the Guyana dollar from US$0.58 to $0.50.

Guyana's membership in the Caribbean Free Trade Association (CARIFTA) became effective December 29, 1966. A supplementary agreement of the same date provided protection for petroleum products produced in Guyana, which would become significant if oil is discovered, produced, and refined there. Presently there seem to be no other mineral trade implications.

Table 2.—Guyana: Exports of principal mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Bauxite:			
Dried	1,284,116	1,555,464	Canada 998,522; United States 532,371.
Calcined	502,445	500,401	United States 217,552; Canada 41,361.
Alumina	279,704	301,719	Canada 111,301; Norway 97,498; United States 44,934.
Manganese ore and concentrate	169,180	197,171	All to Trinidad and Tobago.[2]
Nonmetals:			
Diamond, uncut and cut but unset. carats	102,577	92,085	United States 32,147; United Kingdom 28,518; Netherlands 13,347.
Stone, crushed, gravel, macadam	1,283	437	All to Surinam.[3]

[1] In addition to commodities tabulated, Guyana exports small quantities of ferrous and nonferrous scrap, gold, and clay.
[2] In transit. Most of quantity shown was transshipped for United States ports.
[3] Imported from Guyana by Surinam.

Sources: Guyana Ministry of Economic Development. Statistical Bureau: Monthly Account of External Trade, December 1965, December 1966. Guyana Lands and Mines Department: Annual Report 1966.

Table 3.—Guyana: Imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Iron and steel: Semimanufactures	13,014	15,016	United Kingdom 7,306; Belgium 2,621; Canada 1,188.
Nonmetals:			
Asbestos and asbestos-cement building materials.	2,022	402	Belgium 324; United Kingdom 71.
Cement	30,375	53,704	Trinidad and Tobago 41,204; Jamaica 12,302.
Fertilizer materials: Nitrogenous:			
Ammonium sulfate	21,775	23,617	Trinidad and Tobago 18,473; West Germany 5,054.
Lime	1,330	1,578	All from United Kingdom.
Limestone, agricultural, ground	9,801	5,604	Mainly from Barbados.
Sodium hydroxide	41,085	27,670	Mainly from United States.
Mineral fuels: Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	194	241	Mainly from Trinidad and Tobago.
Kerosine do.	182	239	Do.
Gas oil do.	325	482	Do.
Diesel oil do.	60	56	Do.
Residual fuel oil do.	1,665	1,470	Do.
Lubricating oil do.	r 20	25	United Kingdom 10; Jamaica 8.
Lubricating greases	355	366	United Kingdom 142; United States 84; Jamaica 70.

r Revised.
[1] Official sources do not include detail for many classifications. However, imports into Guyana include pig iron, semimanufacturers of copper, lead, tin, and aluminum, wrought or partly wrought silver, phosphatic and potassic fertilizers, salt, solid fuels, asphalt, and some petroleum refinery products.

Sources: Guyana Ministry of Economic Development. Statistical Bureau: Monthly Account of External Trade, December 1965, December 1966.

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COMMODITY REVIEW

METALS

Aluminum.—During 1967 both Demerara Bauxite Co., Ltd. (DEMBA), and Reynolds Metals Co. virtually completed expansion programs, begun early in 1966, at reported costs of $24 million and $15 million, respectively.

Included in DEMBA's program was construction of a 770-foot-long bridge across the Demerara River, linking Mackenzie on the east side with Wismar and Christianburg on the west. This enables the company more readily to exploit deposits west of the river, an important consideration in view of the progressive depletion of DEMBA's bauxite deposits in the Ituni area.

Also a part of the program was the construction of a seventh calcining kiln, bringing total capacity to 700,000 tons per year. Large stripping equipment and additional engines and rolling stock were purchased, and generators adding 12,500 kilowatts to the available power supply were installed.

A number of strikes of short duration occurred during the period, both against DEMBA itself and against the contractors constructing the expansion projects. A 15-percent pay increase for 60 percent of the employees was the basis for settlement. Additional improvement in living conditions and employee morale was probable as a result of programs of the U.S. Agency for International Development, begun in the first half of 1967, to build a road from Atkinson to Mackenzie, and to construct about 1,000 workers' homes at Mackenzie.

Reynolds Guyana Mines, Ltd., a fully owned subsidiary of Reynolds Metals Co., became the operating agency for the company in Guyana. A plant to calcine bauxite was constructed at Everton and reportedly is operating; however, no throughput data for 1967 are available. Reynolds has also been improving its river transportation facilities, because the company must barge bauxite to Everton as well as ship the plant products. This company, like DEMBA, had some labor trouble late in 1966, but no reports of strikes during 1967 have been received.

Both DEMBA and Reynolds were actively drilling in search of new ore; DEMBA conducted seismic work as well. Total footage drilled was reported as 145,553, of which Reynolds drilled 101,808 feet, DEMBA the remainder.

The Guyanese Government has adopted the policy of requiring some conversion of bauxite in Guyana as a condition for granting concessions, but private capital will not set up bauxite processing facilities, smelters in particular, without assurance of adequate electrical power. A feasibility study was being conducted by a United Nations team to determine availability of hydroelectric power and to recommend location and type of construction. Phase I of this study was completed in mid-1967 with selection of Tiboku Falls on the Mazaruni River as the most favorable site. Phase II, on the feasibility of dam construction, is to be completed late in 1968. Alcan Aluminum, Ltd., in mid-1966 indicated its possible interest in erecting a smelter and fabricating facility, and its subsidiary, Demerara Bauxite Co., Ltd., contributed $150,000 toward the power study.

At the beginning of 1967, Alcan announced its acquisition of a half interest in an aluminum smelter in Norway with an annual installed and operating capacity of 185,000 short tons which will be increased by 50,000 short tons in the near future. This action caused some uneasiness in Guyana because it was interpreted as abandonment of Alcan's plans for a smelter there. Final decision, however, probably must await the completion of the feasibility study.

Copper.—The Guyana Department of Geology and Mines drilled over 10,000 feet of diamond drill holes on the Groete Creek copper-gold anomaly, which had been examined earlier by Torbrit Silver Mines, Ltd. (Canada), and relinquished. Test drilling on a similar anomaly at Aranka on the Cuyuni River was resumed.

Gold.—Local interests, acting in conjunction with Torbrit Silver Mines, Ltd. (Canada), obtained an exploration permit for the Peter's mine, on the Puruni River. A recent U.S. Geological Survey report [4]

[4] Weissenborn, A. E. An Appraisal of the Mineral Potential of the Peter's Mine Area, Northwest District, Guyana. U.S. Geological Survey Open File Report G-2, August 1966, 20 pp.

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estimates a gold reserve of 160,000 ounces. No development work has been reported.

Manganese Ore.—Production of manganese ore by Northwest Guiana Mining Co., Ltd., a subsidiary of Union Carbide Corp., at the Matthews Ridge mine in northwest Guyana remained at the 1966 level. Substantial reserves remain, yet the ore is low grade—during the year some shipments contained only 37 percent manganese. Higher grade streaks containing 45 to 47 percent manganese are present in the deposit, but do not persist with depth.

An additional cause for concern is that Matthews Ridge lies within the area claimed by Venezuela. The company completed drilling a similar smaller deposit, in undisputed territory near Pipiani on the Barama River, but results have not been announced. Total depth of the 21 holes drilled was 6,506 feet. Prospecting south of Aranka in the same general area began in June and continued through the year-end.

Molybdenum.—American Metal Climax, Inc., examined 9,500 acres at Eagle Mountain, south of the Potaro River, for molybdenum; results are not yet available.

MINERAL FUELS

Petroleum.—At the beginning of the year, Continental Oil Co. held both onshore and offshore concessions, from the Venezuelan boundary to a point about 32 kilometers east of Georgetown. From this point eastward to the Courantyne River, onshore and offshore concessions were held by Guyana Shell, Ltd. Continental's onshore area is a belt about 50 kilometers deep parallel to the coast; Shell's claim reaches about 100 kilometers up the Berbice River. An oil exploration lease was granted to Phoenix Canada Oil Co., Ltd., and Dominion Leaseholds, Ltd., in March 1966 and remained in force during 1967. It covered about 673,000 hectares of the Takutú Basin, extending from a point about 320 kilometers above the mouth of the Essequibo River westward to the Brazilian border.

During the year, Tenneco Oil Co. purchased a half interest in Continental's holdings. Two holes were drilled about 85 kilometers offshore. The first was dry, and was abandoned at 8,930 feet, and the second was stopped at 9,647 feet to release drilling equipment for a previous commitment. Because of the Venezuelan border dispute, Continental's concessions may be subject to further negotiation.

Under the terms of its concession, Guyana Shell was required to drill six holes "to basement", three along the Berbice River, two on the west bank of the Courantyne, and one on the coast near the concession's western limit. Depths varied from 1,550 to 4,430 feet. Results were not encouraging, but both Shell and Continental have applied for renewal of their exploration licenses.

Geophysical exploration has shown about 11,000 feet of sediments in the Takutú basin, including carbonaceous shale possibly of Permian to Triassic age. Results of field operations by the oil companies begun during the second half of 1967 are not yet available. A joint program with Petróleo Brasileiro was being considered.

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The Mineral Industry of Hungary

By Roman V. Sondermayer [1]

Hungary did not produce a great variety of mineral products during 1967, and only bauxite and alumina output were of world consequence. Mineral fuels, iron and steel were important from the domestic viewpoint. Except for bauxite, alumina, and low rank coals, mineral consumption was much larger than production, and substantial imports were needed.

The contribution of the mineral industry to the Hungarian social product [2] was about 6 percent in 1966, the latest year for which such data are available. Roughly one-eighth of the total labor force, or approximately 176,000 persons, were employed by the mineral industry.

Major events during 1967 included discovery of new bauxite reserves in the Bakony area, development of the Halimba bauxite mine, expansion of Almafuzito and Ajka alumina plants, completion of a new copper foundry at the Czepel Iron Works near Budapest, and planning and designing a new sulfur plant at Szony.

PRODUCTION

Although overall mineral production technology in Hungary cannot be considered advanced, several developments, mostly small ones, can be regarded as modern and up to date. Underground methods prevailed in mining, but because of inadequate mechanization and lack of incentive for workers, productivity generally remained low in comparison with that in non-Communist Europe.

In oil production, pumping prevailed. Hungarians used production stimulation methods, specifically fracturing and acidizing, on a wide basis, but secondary recovery operations remained minimal. The Soviet designed turbodrill was used on about 70 percent of operating oil and gas drilling rigs.

Performance of many plants and facilities of the country's mining and metallurgical industry designed by Soviet experts and equipped with Soviet equipment was less than expected, and a tendency toward purchasing equipment in the West, noted in the past, continued.

[1] Foreign mineral specialist, Division of International Activities.

[2] As in other Communist countries of East Europe, Hungary does not report on its gross national product (value of all final goods and services produced) but rather publishes a figure for the social product, which generally excludes items such as banking fees, rent, education, defense, public administration, and health services.

Table 1.—Hungary: Production of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Aluminum:					
Bauxite thousand tons	1,363	1,477	1,478	1,429	1,649
Alumina	239,002	245,917	267,000	288,000	328,000
Metal:					
Ingots	55,496	56,874	58,099	60,496	61,796
Semimanufactures, unalloyed, rolled	16,663	17,615	16,769	17,094	• 17,000
Semimanufactures, alloyed, rolled	5,114	5,050	6,242	7,124	• 8,000
Iron and steel:					
Iron ore thousand tons	733	775	762	747	715

See footnotes at end of table.

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Table 1.—Hungary: Production of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals—Continued					
Iron and Steel—Continued					
Pig iron:					
For steel	1,285	1,404	1,513	1,584	e 1,580
For foundry—thousand tons	101	89	69	62	e 65
Total—do	1,386	1,493	1,582	1,646	1,645
Ferroalloys—do	12	6	7	7	NA
Steel ingots—do	2,374	2,365	2,520	2,648	2,739
Rolled products:					
Bars, rods, shapes, sections—do	801	822	866	870	NA
Concrete reinforcement bars—do	94	109	86	107	NA
Plates and sheets:					
Thick—do	220	215	208	192	NA
Medium—do	254	250	261	222	NA
Others [2]—do	165	203	210	273	NA
Total—do	r 639	668	679	687	NA
Rails and fish plates—do	97	52	87	79	NA
Total—do	r 1,631	1,651	1,718	1,743	1,773
Manganese ore	152,371	171,196	213,000	210,000	e 215,000
Nonmetals:					
Bentonite	112,697	98,384	107,000	91,000	e 100,000
Cement—thousand tons	1,798	2,257	2,383	2,601	2,656
Dolomite	431,801	482,114	560,000	622,000	630,000
Fertilizer materials:					
Nitrogenous:					
Gross weight	386,950	448,762	724,119	816,000	e 917,000
Nitrogen content	79,301	91,958	148,000	167,000	e 187,000
Phosphatic:					
Gross weight	516,510	543,545	615,431	715,000	e 824,000
Phosphorous pentoxide (P_2O_5) content	88,368	99,931	117,000	131,000	e 140,000
Kaolin	44,234	50,338	54,000	72,000	NA
Lime, calcined	633,223	735,629	709,104	773,000	e 780,000
Quartzite	35,937	42,360	40,000	39,900	e 40,000
Refractories:					
Magnesite products	56,648	64,278	e 65,000	NA	NA
Shamotte products	185,680	181,470	e 183,000	NA	NA
Silica products	11,308	12,702	e 13,000	NA	NA
Sulfur, elemental	2,985	3,099	3,450	3,521	e 3,500
Mineral fuels:					
Coal:					
Bituminous—thousand tons	3,710	4,125	4,362	4,360	4,053
Brown—do	21,934	22,363	22,190	21,563	19,591
Lignite—do	4,836	5,060	4,885	4,425	3,385
Total—do	30,480	31,548	31,437	30,348	27,029
Coke:					
Oven and beehive—do	660	665	642	646	642
Other (including breeze)—do	554	544	605	598	NA
Total—do	1,214	1,209	1,247	1,244	NA
Fuel briquets—do	1,226	1,301	1,340	1,352	1,068
Gas:					
Natural—million cubic feet	22,816	29,275	41,313	57,958	72,182
Manufactured—do	15,646	16,873	18,673	18,681	NA
Petroleum:					
Crude—thousand tons	1,756	1,801	1,802	1,705	1,686
Natural gasoline	26,391	22,037	20,762	60,137	NA
Refinery products:					
Gasoline—thousand tons	333	370	445	560	605
Kerosine—do	72	38	21	19	NA
Diesel fuel—do	861	970	1,045	1,236	1,233
Heating oil—do	1,403	1,642	1,725	1,722	1,801
Lubricants:					
Oils—do	102	111	106	120	e 125
Greases—do	19	19	19	19	e 20
Paraffin, crude	4,963	5,520	5,655	5,291	e 5,500
Bitumen, natural and refinery—thousand tons	416	455	450	514	e 550

e Estimate. p Preliminary. r Revised. NA Not available.

[1] In addition to reported commodities, Hungary is known to produce arsenic, copper, gold, lead (mine and smelter), silver, uranium, zinc, china clay, diatomite, and peat.

[2] Includes: Black and thin; picked; galvanized; tinplate; dynamo sheets; transformer sheets; coal rolled bright sheets.

Sources: Kozponti Statisztikai Hivatal (Office of Statistical Council). Statiszikai Evkonyv 1966 (Statistical Yearbook for 1966), Budapest 1967, 439 pp. for years 1962 through 1966. Figures for 1967 were taken from U.S. Foreign Service dispatches from the U.S. Legation Budapest and Bureau of Mines files.

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TRADE

During 1966 the pattern of Hungarian mineral commodity foreign trade remained essentially the same as in recent years. The country imported most of its requirements for nonferrous base metals, iron ore, high-rank coals, and crude petroleum. Exports consisted of bauxite, manganese ore (not definitively reported in official statistics), and various semimanufactured products. Hungary's most important trading partner was the U.S.S.R., which provided most of the imported fuels, metallic ores, and metals in exchange for semimanufactured and finished products. Foreign trade with Communist countries accounted for up to 80 percent of the total trade of Hungary.

Table 2.—Hungary: Exports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Bauxite, thousand tons	564	621	Czechoslovakia 256; East Germany 185; Poland 115; West Germany 60.
Alumina, do	194	175	Poland 86; Austria 26; East Germany 19; U.S.S.R. 13; Czechoslavakia 10.
Ingots	18,726	15,134	United Kingdom 8,304; Czechoslovakia 2,062.
Scrap [2]	NA	3,194	Italy 1,908; Belgium-Luxembourg 483.
Copper, scrap	NA	782	West Germany 405; Austria 251; Belgium-Luxembourg 126.
Iron and steel:			
Pig iron	82,839	79,575	Austria 33,042; Italy 15,202; Yugoslavia 5,907.
Rolled products, excluding pipes, thousand tons	605	580	Czechoslovakia 126; Poland 60; West Germany 43; Italy 41; Austria 31; Rumania 24; Yugoslavia 24; India 21.
Pipes and fittings	64,793	64,892	Yugoslavia 7,251; Poland 6,378; Denmark 5,333; Netherlands 4,871; Austria 4,141; Bulgaria 3,758; West Germany 3,691; Iran 2,827.
Lead ores and concentrates [2]	NA	3,195	All to West Germany.
Manganese ore [2]	NA	42,946	All to West Germany.
Zinc, ores and concentrates [2]	NA	2,450	All to West Germany.
Nonmetals:			
Cement, thousand tons	r 402	330	Czechoslavakia 155; Yugoslavia 118.
Clays, all kinds [2]	NA	19,179	Austria 16,484; Sweden 1,575; Denmark 1,120.
Infusorial earths [2]	NA	11,915	Italy 5,568; Netherlands 3,469; Sweden 1,978.
Mineral fuels:			
Coke [2]	90,577	101,393	Austria 84,228; Italy 13,069; Yugoslavia 4,096.
Petroleum refinery products:			
Gasoline, thousand tons	150	163	Poland 94; Austria 51.
Diesel fuel [2], do	155	160	West Germany 111; Switzerland 21.
Heating oil, do	178	316	Austria 313.
Lubricants	13,740	13,709	Yugoslavia 3,826; Undisclosed 9,883.
Bitumen, thousand tons	170	201	Czechoslovakia 78; Austria 38; Bulgaria 15.

[1] Because Hungary publishes only limited data on foreign minerals, this table has been compiled from Hungarian and United Nation sources. Much information is partial and unless noted is from Statisztikai Evkonyv 1966 (Statistical Yearbook 1966), Budapest 1967, 389 pages.
[2] Source: Statistical Office of the United Nations.—New York, 1967.

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Table 3.—Hungary: Imports of selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources in 1966
Metals:			
Aluminum ingots	24,053	[2] 2,500	All from the U.S.S.R.
Cadmium	[2] 2	[2] 9	Do.
Chromite	NA	[4] 23,000	Turkey 14,000;[3] U.S.S.R. 9,000.
Copper and copper products	[2] 7,200	[4] 10,429	U.S.S.R. 7,900;[2] Belgium 1,625; Australia 524; Yugoslavia 380.
Iron and steel:			
Iron ore—thousand tons	2,481	2,696	U.S.S.R. 2,572.
Pig iron—do	105	131	U.S.S.R. 129.
Ferroalloys—do	r 21	41	U.S.S.R. 25; West Germany 11; Turkey 5.
Semimanufactures excluding pipes—do	r 489	461	U.S.S.R. 157; Czechoslovakia 53; Austria 20; West Germany 7.
Pipes and fittings—do	31	31	West Germany 10; Yugoslavia 7; U.S.S.R. 3.
Lead, refined	NA	[2] 9,800	All from the U.S.S.R.
Mercury—76-pound flasks	[2] 87	NA	
Tin—long tons	1,758	1,452	Denmark 254; Indonesia 173; Netherlands 173.
Zinc	13,373	14,403	Poland 7,066; U.S.S.R. 4,000; West Germany 300.
Nonmetals:			
Asbestos	10,702	14,681	U.S.S.R. 12,600.
Cryolite	[2] 1,000	1,200	All from the U.S.S.R.
Clay calcined	68,452	66,935	Czechoslovakia 62,902.
Fertilizers manufactured:			
Nitrogenous—thousand tons	315	269	Poland 54; Bulgaria 47.
Potassic—do	199	286	East Germany 185.
Phosphatic—do	107	110	All from the U.S.S.R.
Fire clay	[2] 3,800	[2] 5,800	Do.
Graphite	[2] 1,300	1,100	Do.
Magnesite, calcined	69,376	78,180	Czechoslovakia 47,018.
Pyrites, bulk—thousand tons	145	154	NA.
Phosphate rock—do	429	403	U.S.S.R. 358; Morroco 20.
Salt, all kinds—do	240	263	Rumania 161.
Sulfur, elemental—do	159	151	U.S.S.R. 61;[2] Canada 40.
Mineral fuels:			
Briquet	576	503	All from East Germany.
Coal, all kinds—thousand tons	2,665	2,384	Poland 930; U.S.S.R. 870; Czechoslovakia 584.
Coke—do	1,114	1,200	U.S.S.R. 604; Poland 231.
Gas, natural—million cubic feet	7,600	7,600	All from Rumania.
Petroleum:			
Crude—thousand tons	2,251	2,911	U.S.S.R. 2,478; United Arab Republic 433.
Refined products:			
Gasoline—thousand tons	108	56	All from U.S.S.R.
Diesel fuel—do	160	131	Do.
Heating oils—do	102	262	U.S.S.R. 253.
Lubricants—do	31	24	U.S.S.R. 16; Austria 8.

NA Not available.

[1] Because Hungary publishes only limited data on foreign trade in minerals, this table has been compiled from Hungarian and Soviet sources. Much information is partial, and unless noted is from Statisztikai Evkonyv 1967 (Statistical Year 1966), Budapest 1967, 423 pp.

[2] Source: Vneshnyaya Torgovlya S.S.S.R. za 1966 god (Foreign Trade of the U.S.S.R. for 1966). Moscow 1967, 324 pp.

[3] Source: Statistical Office of the United Nations. New York, 1967.

[4] Figure derived from United Nations and Soviet sources.

COMMODITY REVIEW

METALS

Bauxite and Aluminum.—Hungary remained a significant European bauxite producer in 1967 with an output of about 1.6 million tons. Aluminum metal output, modest by European standards, was only about 61,000 tons. The imbalance between bauxite and metal output results from inadequate domestic electric power generating facilities. The potentially high cost of generating more electricity from indigenous hydropower and/or mineral fuels, reserves of which are meager, precludes the installation of additional generating facilities necessary for the expansion of aluminum production capacity.

To satisfy domestic aluminum demand and to obtain some foreign exchange earnings from the Nation's bauxite re-

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serves, Hungary concluded an agreement several years ago with the U.S.S.R. by which the Soviets will refine up to 300,000 tons of aluminum per year by 1980. Consequently, no major increases of aluminum smelting facilities are planned in Hungary for the foreseeable future.

Exploraiton for bauxite continued during 1967. A new bauxite deposit, 3.5 kilometers long and averaging 0.4 kilometer in width, was discovered between Bakony and Vertes hills. Because of the lack of adequate drilling equipment, the thickness of the bauxite formation was not determined. At yearend, personnel from the Bauxite Exploration Enterprise (Bauxitkutato Vallalat) were preparing for deep drilling.

In the area of Kincsesbanya several new mines were under development in 1967. The Joseph III mines and the Rakhegy II mine were under development, and plans were made for the Bitto II mine which will be near the Rakhegy mine.

The development of the Halimba mine continued in 1967. When completed, the mine will have an annual capacity of 600,000 tons of bauxite. Underground waters, as elsewhere in the Bakony area, created difficulties, and extensive pumping was necessary to prevent karst waters from flooding the works.

The second stage of expansion of the Almafuzito Alumina Plant was underway in 1967. A new bauxite storage facility, with a capacity of 100,000 tons of bauxite, was under construction at yearend. The storage is of open construction with a French made disc-loader running on rails along the top of the retaining walls. The completion of plant construction was scheduled for 1970 when output is supposed to reach 280,000 tons of alumina per year. Total cost of reconstruction was reported to be the equivalent of about $127 million.

The expansion of the Ajka Alumina Plant continued during 1967. When completed in 1968, output of the plant should reach 130,000 tons of alumina annually.

Copper.—A fully automated copper foundry with an annual capacity of 40,000 tons of copper castings was built as a part of the Czepel Iron and Steel Works in Budapest. The Federal Republic of Germany, the United Kingdom, and the U.S.S.R. supplied equipment for the foundry. In addition to copper castings, the new installation will produce copper wire down to 0.03 millimeter. The foundry, housed in 3 halls, can be operated by 30 men. Reportedly, investment in the foundry amounted to the equivalent of $16 million.

Iron and Steel.—Construction of the Borsod Ore Dressing Works, a new unit of the Lenin Metallurgical Works, progressed satisfactorily during 1967. When completed, the plant will have two production lines with a total annual output of 1.5 million tons of agglomerates with an average iron content of 45 percent. Reportedly the plant will be highly automated, and the completion date was set for the end of 1970.

The Danubian Iron Works remained the center of activity in the Hungarian ferrous metal industry. A new slag grinding plant was completed, and the annealing furnace of the Lorinc rolling mill of the Danubian Iron Works was operational in 1967. The furnace will make it possible to produce 30,000 tons of easily weldable sheet annually.

Lead and Zinc.—New deposits of lead-zinc ores were discovered in the Matra Mountains. Reports do not indicate the extent of ore reserves or their metal content.

Uranium.—Production of uranium was reported in the vicinity of Pecs at Mecsek by the Mecsek Ore Mining Trust. Reportedly the mine is one of the largest uranium operations in Europe with the quality of ores equal to those produced in other mines on the continent.

NONMETALS

The Hungarian nonmetals industry was small and insignificant by world standards and some industrially significant nonmetallic minerals had to be imported. However, during 1967 output was adequate to cover domestic needs for cement, lime, clays, and other construction materials.

Bentonite.—Bentonite processing facilities in the past were located in several places in the country. To improve the product quality, the processing of bentonite has been concentrated in one place at Mod and placed under the supervision of personnel of the National Ore and

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Mineral Mining Enterprise. Annual capacity of the new facility was reported to be 100,000 tons of raw bentonite.

Cement.—Preliminary work, designing, and planning for the Berement cement plant was completed at yearend. Construction will start in 1968, and the plant will reach the capacity of 1 million tons of cement in 1972.

Reserves of limestone and clays are adequate to sustain a production of 1 million tons per year for 40 years.

At the Selp Cement Factory, 150 tons of refractory cement were produced on an experimental basis. Tests in metallurgical plants will determine whether the plant will continue production of refractory cement on an industrial scale.

Fertilizer Materials.—The Tisza Chemical Combine was in full operation in 1967 after overcoming initial production problems. However, output of nitric acid was a bottleneck and the full capacity of 350,000 tons of nitrogenous fertilizers was not reached.

Sulfur.—Plans for the construction of the first gas/oil desulfurization plant at the Szony Oil Combine were completed in 1967. The plant is scheduled to start production in 1969, and is being built with help from the Soviet Union. It will have an annual capacity of 4,800 tons of sulfur.

MINERAL FUELS

Although Hungary's production of all types of coal dropped 3.3 million tons in 1967, coal remained the principal source of energy in the country. Natural gas and petroleum, however, were increasing their share in the country's energy supply. Lack of high rank coals and inadequate domestic petroleum output necessitated imports of bituminous coal, coke, crude oil, and petroleum refinery products to meet requirements during 1967.

Coal.—After a cost analysis study in preparation for economic reforms, the Hungarian coal mining management has begun closing uneconomic mines. Several were closed in northern Hungary and some 8,000 miners lost their jobs. Plans call for reduction of operating mines from the 125 in 1967 to 80 by 1970. By 1975 the latter number will be cut somewhere between 60 and 65 mines. In addition, demand for coal in Hungary has fallen every year in recent years. The reduced demand can be attributed to the modernization of the electric power industry and to cheaper competitive fuels, mainly natural gas.

After intensive exploration in Nograd county, Hungarian geologists found new coal deposits, bringing total coal reserves of the area up to 20 million tons. The new figure indicates lower reserves than those announced in 1965 after preliminary exploration.

Development of the Visonta mine continued during 1967. The mine will supply coal to the 400-megawatt Gyoengyoes power station. The open-cast mine at Oroszlany will close in 1968 because of high production costs. In accordance with this decision, output was gradually reduced during 1967.

Petroleum and Natural Gas.—Although Hungary's oil fields are being gradually exhausted, new discoveries of oil and gas together with imports, increased the total supply of hydrocarbons in 1967.

The most extensive and successful drilling was carried out in southern Hungary close to Yugoslavia in the Tizsa-Maros region. At yearend 1967, 15 wells were completed in the Algyo Basin where a tank farm consisting of four 60-cubic-meter tanks was constructed. The deepest test well in Zala county struck gas at a depth of more than 4,000 meters at the beginning of 1967. The discovery is significant because it has opened up a deep gas bearing formation in that area.

Expansion of the Szazhalombatta refinery was underway; the 1967 annual capacity of 1 million tons will be increased to 3 million tons by 1968.

One third of the gas output in Hungary is manufactured gas. Natural gas was becoming a significant source of energy in the country during 1967 and its share of total energy output was about 8 percent. The significance of the new gas discoveries in the vicinity of Szank could not be evaluated because of lack of data. Existing fields of Bajesa and Babolsa were expanded.

Several natural gas processing plants were put into operation in Hungary during 1967. The plant at Bergfurdo was put on stream early in spring and the first

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unit of a plant at Kardoskut also became operative. Capacities of these plants were not reported. However, during 1967 the Kardoskut plant delivered 1 million cubic meters of gas. The natural gas plant at Hajduszoboszlo produced more than 1 million cubic meters of dry gas during the year.

The storage of natural gas in facilities designed for manufactured gas has become a common practice in large Hungarian cities. Because the construction of converting plants at Koebanya was behind schedule, the gas supply of Budapest was erratic in times of peak consumption during the winter of 1967.

To promote and facilitate the supply of propane and butane gas, 50 gas distributing stations in villages throughout Hungary will be made operational by 1970; the first started operating at Gyoengyoes in 1967.

Construction of an oil pipeline from Nagylengyel to Devecser was completed in the spring of 1967. During the year the pipeline was tested and became operational at yearend.

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The Mineral Industry of India

By J. M. West [1] and Charles W. Sweetwood [2]

India's resources and production of coal, iron ore, beryl, manganese, mica, bauxite, and building materials are important by world standards. Of these commodities iron ore, manganese, mica, and beryl occupy positions of prominence in world markets. Although the mineral industry's share of national income is low—about 1.1 percent of the total $32,210 million estimated by the Indian Government in 1966–67—minerals contributed significantly to the country's foreign exchange income. In 1967, they accounted for about one-sixth of total export earnings of $1,610 million.

Efforts were continuing in 1967 to relieve production deficiencies. Unfortunately, some of the development projects that were in progress had fallen behind schedule and costs were soaring.

However, noteworthy strides were made in geological exploration during the year. Emphasis was placed on fieldwork related to high-priority nonferrous metals and phosphate rock, assisted in both cases by U.S. Agency for International Development-sponsored programs. The flight phase of Operation Hardrock, a nonferrous metals-oriented airborne geophysical survey, neared completion, and Operation Softrock, a project of geological and metallurgical assistance in exploring for phosphate rock, had progressed well. During the year, a United Nations-assisted geophysical survey for ferrous metals was started in the State of Madras.

Continuing recession in the Indian economy caused problems in the coal industry, which included under-utilization of capacity and a slump in demand. Removal of price and distribution controls and a simultaneous industry wide wage increase ordered by the Government resulted in ill-timed consumer price increases. There was growing labor unrest. The imbalance between steel output and consumption, resulted in an overproduction of some products and a shortage of others, which necessitated large-volume imports. The expansion programs of Hindustan Steel Co's Durgapur and Rourkela plants were behind schedule; consequently, previously announced long-range plans were shelved.

The Indian minerals industry provided employment in 1967 for about 681,000 workers, or about 4.2 percent of the total organized labor force of the country. Coal mining accounted for three-fifths of those employed in minerals. Mineral-related manufacturing industries employed an additional 602,000, of which the iron and steel industry accounted for about two-fifths.

The Government participates in the minerals industry through its various agencies and public sector enterprises. It has scheduled 5-year plans, which contain sections on mineral development to expand and diversify the nation's industrial base.

During 1967, construction progressed on several new alumina plants and on an aluminum smelter located near Belgaum, close to Goa in western India. A new zinc smelter was commissioned late in the year at Debari, near Udaipur, Rajasthan, and development continued at an underground copper mine based on 1-percent-copper ore at Khetri, Rajasthan. At Korba, Madhya Pradesh, a 200,000-kilowatt thermal electric power station and a 3 to 4-million-ton-capacity coal mine were being completed with U.S.S.R. assistance and establishment of a coal-based fertilizer plant was under consideration. Construction was reported to have started on the U.S.S.R.-backed Bokaro steel project.

In petroleum, important developments have followed several years of geophysical

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work in the Gulf of Cambay, where outlook appears favorable. The Indian Oil and Natural Gas Commission expected to start reconnaissance in July 1968 in preparation for oil exploration in the vicinity of Aliabet Island, 25 miles west of Ankleshwar, Gujarat State. The Commission also planned to begin construction of a supply pier and stationary drilling platform in late 1968 after the monsoon season.

PRODUCTION

The value of Indian mineral output in 1967 rose 8 percent in terms of rupees to Rs.2,745.4 million but fell 13 percent in terms of dollars to $366.1 million.[3] The apparent incongruity resulted from devaluation of the rupee. Of the more important mineral commodities produced, bauxite, chromite, and ilmenite showed increases. Coal output changed only marginally; however, stocks rose, indicating a decrease in demand. Coal and lignite continued to represent about three-fourths of the total value of mineral production; the balance consisted of $50 million in metallic minerals and $40 million in industrial minerals (excluding cement). Outputs of steel and ferroalloys declined in 1967, but cement producion was about 6 percent higher for the year. Aluminum output was about 16 percent higher in 1967. Outputs of petroleum refinery products and domestic crude oil during 1967 rose 19 and 23 percent, respectively.

[3] Values reported here excluded petroleum, minor metals classified under the Atomic Energy Act of 1948, and mineral production from Goa.

Table 1.—India: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 [p]
Metals:					
Aluminum:					
Bauxite thousand tons	565	591	[r] 707	750	759
Metal	55,280	56,667	[r] 68,988	83,282	96,352
Antimony, smelter	909	840	848	877	920
Beryl [2]	-------	-------	1,367	454	5,325
Chromite	65,042	34,969	[r] 59,685	77,656	103,969
Copper:					
Ore thousand tons	474	473	468	481	441
Metal content of ore	10,010	10,481	10,118	10,300	8,600
Smelter (fire refined)	9,593	9,455	9,360	9,488	8,573
Gold troy ounces	138,409	148,504	130,628	120,244	97,256
Iron and steel:					
Ore thousand tons	[r] 20,400	[r] 20,970	23,660	26,336	26,157
Pig iron do	6,603	6,593	[r] 6,952	7,082	6,953
Ferroalloys do	138	149	170	158	151
Steel ingot and metal for casting thousand tons	5,970	5,946	6,467	6,530	6,387
Semimanufactures do	4,257	4,343	4,515	4,534	[e] 5,000
Lead:					
Concentrate	5,920	6,148	5,496	5,151	4,115
Metal content of concentrate	4,316	4,505	3,981	3,734	2,980
Smelter	3,537	3,624	2,905	2,479	2,368
Manganese ore:					
Over 35 percent Mn thousand tons	766	867	1,019	1,109	965
Under 35 percent Mn [3] do	309	396	485	496	634
Mn content not disclosed do	[r] 221	[r] 142	111	73	-------
Total do	[r] 1,296	[r] 1,405	1,615	1,678	1,599
Monazite	2,429	NA	[e] 2,540	[e] 2,600	[e] 2,600
Silver, smelter troy ounces	128,314	152,234	168,308	89,223	83,142
Titanium:					
Ilmenite thousand tons	26	12	30	30	38
Rutile	1,871	1,871	1,317	1,816	2,547
Tungsten, 60 percent WO_3 basis	5	9	15	27	29
Zinc:					
Concentrate	10,627	10,744	9,641	8,900	9,580
Metal content of concentrate	5,860	5,915	5,317	4,886	5,269

See footnotes at end of table.

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Table 1.—India: Production of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Nonmetals:					
Apatite	13,127	4,049	r 7,076	16,275	13,248
Asbestos	2,756	3,366	r 4,775	6,936	7,344
Barite	37,877	46,225	r 48,283	51,663	46,629
Calcite	13,554	12,862	r 20,481	17,751	16,040
Cement thousand tons	9,355	9,690	10,578	11,052	11,700
China clay do	503	519	r 605	644	645
Corundum	658	540	481	385	307
Diamond carats	1,432	2,260	4,466	r 2,113	7,104
Dolomite thousand tons	1,070	507	r 976	1,047	1,029
Feldspar	21,236	24,382	r 26,771	26,004	27,528
Fire clay thousand tons	368	360	r 448	450	476
Fluorspar	708	389	551	1,069	1,256
Garnet	404	286	r 225	176	300
Gypsum thousand tons	1,191	882	r 1,160	1,293	1,148
Kyanite	31,665	34,091	r 37,481	63,670	49,924
Limestone thousand tons	17,057	16,919	r 19,934	19,603	19,220
Magnesite do	235	208	239	232	253
Mica, block, splittings, and scrap	34,075	29,891	37,531	32,977	21,173
Ocher	20,991	28,056	r 36,587	30,908	37,372
Pyrophyllite thousand tons	5	6	11	8	5
Quartz and silica	215,826	226,093	r 297,000	276,187	269,000
Salt thousand tons	4,551	4,647	4,703	4,508	5,625
Sillimanite	11,285	12,362	11,276	10,286	5,312
Steatite (soapstone) thousand tons	r 116	r 134	r 156	r 148	130
Vermiculite	677	429	732	500	371
Mineral fuels:					
Coal thousand tons	65,956	62,440	r 67,161	70,536	70,501
Lignite do	999	1,569	2,300	2,568	2,901
Coke, all types do	9,745	10,142	11,193	10,766	12,580
Petroleum:					
Crude thousand 42-gallon barrels	12,266	16,965	22,494	e 34,228	42,190
Refinery products:					
Gasoline and naphtha do	12,229	12,689	13,307	17,245	NA
Kerosine do	11,536	12,993	12,491	14,059	
Distillate fuel oil do	12,466	15,148	18,097	20,511	
Residual fuel oil do	13,369	15,183	15,990	17,681	
Lubricants do	274	286	292	406	
Other do	5,717	7,537	8,525	10,745	
Natural gas million cubic feet	e 10,000	e 12,000	e 18,000	14,100	16,400
Carbon black	12,000	NA	14,470	NA	NA

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Includes production of Goa.
[2] United States imports.
[3] Includes ferruginous manganese ore.

TRADE

Iron ore, manganese, and mica accounted for about 73 percent of the total value of mineral exports. The leading mineral, iron ore, ranked third among all goods exported from India, after jute and tea. Total value of mineral ore exports during 1967 increased $1.8 million to $185 million; slightly over half of the total was attributed to iron ore. The value of metals and alloys exported reached $83.8 million; this substantial rise was attributed to expanded sales of pig iron. Imports of ores and minerals rose sharply in 1967 and were valued at $85.4 million. Major import commodities included sulfur, accounting for about half of the total value, phosphate rock, precious and semiprecious stone, and asbestos. Metal and alloy imports rose sharply in value to $294.4 million, of which ferrous metals accounted for about half. Imports of steel, aluminum, copper, lead, and zinc were all significantly higher. In fuels, imports of crude petroleum continued to rise, reaching an estimated 8.7 million tons in 1967. Refinery production was supplemented by about 0.9 million tons of imports, mainly of kerosine and diesel oil from U.S.S.R. and Rumanian sources.

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Table 2.—India: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1966	1967 p	Principal destinations, 1966–67 [1]
Metals:			
Aluminum:			
Bauxite	77,936	66,573	West Germany; United Kingdom; Italy.
Metal, including alloys	2,106	1,480	United Kingdom; Malaysia; Kuwait; Ceylon; Mauritius.
Chromite	43,736	77,548	Mostly to Japan.
Copper and alloys	782	229	Japan; South Viet-Nam; Hong Kong.
Ilmenite	32,076	21,000	Japan; United Kingdom; Italy.
Iron and steel:			
Ore and concentrate [2] thousand tons	13,658	13,918	Mostly to Japan.
Pig iron do	65	489	Do.
Ferroalloys do	19	22	Mostly to United States.
Other, mainly scrap do	785	658	Mainly to Japan.
Lead, all forms	5	6	United Arab Republic; Muscat.
Manganese ore and concentrate. thousand tons	1,249	1,206	Japan; United States; Belgium; Czechoslovakia; West Germany.
Silver, all forms kilograms	2,570	11,477	All to United Kingdom.
Tin, all forms long tons	49	16	Mostly to United Kingdom.
Zinc, all forms [3]	2,532	319	Mostly to Japan.
Nonmetals:			
Asbestos	30	69	Malaysia; Singapore.
Asphalt and bitumen	320	1,467	Mostly to Nepal.
Barite	2,762	6,902	Japan; Ceylon; Kenya.
Bentonite	307	431	Iraq; Ceylon.
Borax	102	60	NA.
Cement	[1] 11,036	NA	Mostly to Nepal.
Chalk	1,254	6	South Viet-Nam; Ceylon.
Clays, excluding bentonite	76	731	Japan; Burma; Singapore.
Feldspar	3,841	8,205	South Viet-Nam; Japan.
Gypsum	------	1,000	NA.
Kyanite	35,726	40,342	United Kingdom; Italy; Sweden; Japan.
Lime	4,825	574	Mostly to Nepal.
Limestone	------	1,012	Mostly to East Pakistan.
Magnesite, calcined and uncalcined	34,228	20,914	Netherlands; West Germany; United States.
Mica, blocks, splittings, etc	30,467	20,608	United States; Japan; Norway; United Kingdom; France.
Salt thousand tons	261	245	Nepal; Japan.
Sillimanite	6,332	1,849	West Germany; Japan; East Germany.
Steatite (block and powder)	10,405	10,319	United Kingdom; Ceylon; West Germany.
Stone, building	2,302	11,686	Mostly to United Kingdom.
Mineral fuels:			
Coal thousand tons	361	246	Ceylon; Burma; Nepal.
Coke	11,067	4,914	Mostly to Burma.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	1,887	1,658	Nepal; Singapore; United Kingdom.
Distillate fuel oil do	------	1,589	Do.
Naphtha do	3,984	4,912	Do.
Paraffin do	71	39	Do.

p Preliminary. NA Not available.
[1] June 1966–March 1967.
[2] Includes Goa.
[3] Mostly scrap in 1966.

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Table 3.—India: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1966	1967 p	Principal sources, 1966–67 [1]
Metals:			
Aluminum, all forms	22,655	48,639	United States; Canada; Belgium; Yugoslavia.
Antimony:			
Ore	2,110	1,660	Bolivia; Thailand; Peru.
Metal	56	15	United Kingdom; Belgium.
Arsenic sulfides	3	9	Singapore; Malaysia.
Copper and alloys, all forms	27,498	46,032	West Germany; United States; Belgium.
Iron and steel:			
Pig iron	30,671	-------	NA.
Ferroalloys:			
Ferrochromium	509	842	Japan; United Kingdom; Norway.
Ferromanganese	778	257	Japan; East Germany; France.
Ferromolybdenum	120	102	East Germany; United States.
Ferrophosphorus	242	244	Mostly from East Germany.
Ferrosilicon	62	77	Mostly from Sweden.
Ferrotungsten	30	24	Mostly from United Kingdom.
Others	288	480	Czechoslovakia; East Germany; Japan; Poland.
Total	2,029	2,026	Japan; East Germany.
Semimanufactures, including ingots and scrap.	496,976	553,883	U.S.S.R.; Japan; United Kingdom; West Germany; United States; Czechoslovakia.
Lead, all forms	38,093	42,780	Australia; Canada; Burma.
Magnesium and alloys, all forms	[1] 240	NA	United States; Norway; West Germany.
Manganese ore	6,382	6,103	All from Ghana.
Mercury 76-pound flasks	2,810	NA	United States; Italy; Mexico.
Nickel, all forms	1,219	2,082	United Kingdom; Canada.
Platinum, all forms troy ounces	4,212	5,112	U.S.S.R.; West Germany; United Kingdom.
Silver do.	6,623	9,709	West Germany; Switzerland.
Tin, all forms long tons	5,870	5,675	Malaysia; United States.
Titanium minerals	1,014	651	All from Australia.
Tungsten ore and concentrate	93	204	South Korea; Burma; Hong Kong.
Zinc:			
Ore and concentrate	-------	20,501	Canada; Australia.
Metal, all forms	37,925	73,501	Australia; U.S.S.R.; Congo (Brazzaville); Canada.
Nonmetals:			
Abrasives, natural, all forms	1,363	1,985	United States; United Kingdom.
Asbestos	29,955	29,483	Canada; U.S.S.R.; United States.
Asphalt, natural	334	2,616	Mostly from United States.
Borax	2,172	2,776	Mostly from Turkey.
Chalk	824	658	United Kingdom; France.
Clay, including bentonite	4,693	8,696	United Kingdom; Czechoslovakia.
Cryolite	1,424	1,182	Italy; Denmark.
Diamond:			
Industrial, thousand carats crude.	NA	660	Mostly from United Kingdom.
Gem variety thousands	e $1,800	$1,830	Ghana; Congo (Kinshasa); Sierra Leone.
Diatomaceous earth	88	1,378	East Germany; Belgium.
Emerald thousands	e $2,560	$2,890	Tanzania; Brazil; Colombia.
Fertilizers:			
Nitrogenous:			
Crude	[1] 9,428	NA	All from Chile.
Manufactured	[1] 1,197,758	NA	United States; Italy; Netherlands; Japan.
Phosphatic:			
Crude	[1] 753,733	NA	Jordan; Tunisia; Morocco; United Arab Republic.
Manufactured	[1] 193,595	NA	United States; Italy; East Germany.
Potassic, manufactured	[1] 142,695	NA	East Germany; West Germany.
Fluorspar	5,908	7,783	Thailand; United Kingdom.
Graphite	2,186	1,237	Ceylon; South Korea.
Gypsum and plaster	7	3	All from United Kingdom.
Magnesite, calcined and uncalcined	272	109	Japan; United Kingdom.
Sulfur	285,877	574,362	United States; Canada; Mexico.
Mineral fuels:			
Coal, anthracite	2,902	1,045	United States; Norway.
Coke	1,397	113	United States; United Kingdom.
Petroleum:			
Crude thousand 42-gallon barrels	[1] 34,500	NA	Iran; Saudi Arabia; Kuwait.
Refinery products thousands	[1] $28,200	NA	United States; U.S.S.R.; Italy; Rumania; Yugoslavia; Iran.

e Estimate. p Preliminary. NA Not available.
[1] June 1966–March 1967.

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COMMODITY REVIEW

Aluminum and Bauxite.—Indigenous production from four private sector enterprises satisfied about 53 percent of the country's aluminum metal requirements in 1967. Bauxite reserves, estimated at 276 million tons, are considered adequate for the foreseeable future. The four aluminum producers had expansion underway in 1967 which collectively would double the present metal output by 1970. Hindustan Aluminium Corp., Renukoot, Uttar Pradesh, now operates fully mechanized mines in the Amarkantak region of Madhya Pradesh and near Ranchi, Bihar; Indian Aluminium Co. has fully mechanized its Bagru Hill mine in the Lohardaga area near Ranchi. Madras Aluminium Co. obtains its ore from the Shevaroy Hills in Madras, where studies for mechanization were in progress. Aluminum Corporation of India was considering conversion to partial mechanization at its Ranchi area mines in Bihar.

About three-fourths of all bauxite mined was consumed in manufacturing alumina and aluminum metal; of the remainder, 143,000 tons was used by the chemical, refractory, cement, steel, petroleum refining, and abrasive industries. The balance was exported, primarily to West Europe. A major exporter of bauxite is Maharashtra Minerals Corp., which is a joint venture of the State Government (26 percent) and private Indian capital. In 1967 the firm was working under a contract with Societe Alluminio Per Axioni (affiliate of Swiss Aluminium of Zurich) and Montecatini/Edison of Milan for export of 850,000 tons of bauxite during 1967–71. Initial delays were faced in this contract, however, owing to poor progress in port, road, and mine development.

Two public sector aluminum projects approved in 1966, to be located at Koyna, Maharashtra, and Korba, Madhya Pradesh, had not yet come under construction in 1967. Indian demand for aluminum metal was expected to reach 300,000 tons annually by 1970; private sector output was scheduled to expand to 223,300 tons by 1970–71. Despite the increasing production and nearly 50,000 tons of imported ingot and products, the supply in 1967 fell short of the estimated demand of 180,000 tons. Canada and the United States provided the bulk of the imports.

Beryl.—Partial exports of beryl recently reported in the Annual Report of the Department of Atomic Energy showed the following shipments to the United States: 1,815 tons valued at $454,000 in 1965, 1,330 tons valued at $353,000 in 1966, and 1,300 tons valued at $345,000 in 1967. In 1967, the Indian Government was active in conducting surveys and assisting operators of beryl mines.

Chromite.—Tata Iron and Steel Co.'s Kittaburu chromite mine in Orissa State is a significant operation that has been partly mechanized. Total production was considerably higher in 1967 and was valued at $955,866. Major domestic consumers were refractory and chemical manufacturers with estimated 25,000- and 11,000-ton annual consumptions, respectively. Japan is the principal recipient of Indian chromite exports. Indian reserves, mostly in Orissa and Mysore States, total about 4.9 million tons.

Copper.—The sole producer, Indian Copper Corp., operated its Ghatsila plant in Bihar close to its annual capacity of 9,000 tons of electrolytic copper, but output was far below India's estimated demand of 150,000 tons. Ore from the private firm's Mosabani mine averaged 2.02 percent copper; smelter production was slightly lower than in 1966. The only other copper development of note, the public sector Khetri Copper Project, under Hindustan Copper, Ltd., was making uncertain progress because of disagreements among Government policy makers and uncoordinated execution of plans. However, underground development at Khetri proceeded reasonably well; 15.5 million tons of ore grading about 1 percent copper had been proved by 1967, with 3 million tons actually blocked out for mining. The project, when complete, will utilize local ores and those from the nearby Kolihan deposit to feed a concentrator and smelter capable of producing 31,000 tons of electrolytic copper and 600 tons per day of byproduct sulfuric acid. The sulfuric acid will be used in the manufacture of 214,500 tons of superphosphate fertilizers annually.

Another sizable copper deposit was being mapped and developed in Bihar State as part of the Rakha Copper Project under Hindustan Copper Ltd. Total

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proved and indicated reserves at Rakha have been placed at 91.2 million tons of ore averaging 1.3 percent copper.

It was reported that the Mysore State Government had formed the Chitaldrug Copper Co. to exploit an estimated 1-million-ton, 2-percent copper deposit in the Ingladhal area of Mysore. Plans are to mine and upgrade ores to about 20 percent copper, producing about 250 tons of concentrate daily beginning in 1968. This concentrate probably will be shipped to Khetri for smelting.

Gold.—Government-owned Kolar Gold Mining Undertakings and Mysore State-owned Hutti Gold Mines Co. were the only producers of gold in India in 1967. Combined proved reserves were estimated at 3.8 million tons of ore grading 0.27 troy ounce of gold per ton. Mine operations are at sufficiently great depth and under such extreme conditions that subsidy is necessary for continuation. Cost of production was reported at $50 per ounce in 1967 compared with $38.96 per ounce in 1962. Employment in the mines is about 10,000, counting all personnel. Gold recovery in the last few years has declined steadily to 0.20 ounce per ton of ore for the Kolar group and 0.28 ounce per ton for the Hutti mines in 1967.

Iron Ore.—Iron ore remains one of India's most important mineral commodities for earning foreign exchange. Reserves account for about one-fourth of the world's total, with principal deposits in the States of Goa, Bihar, Orissa, Mysore, Madhya Pradesh, Maharashtra, and Andra Pradesh. Goa accounts for roughly one-fourth of the production and half of the exports. Iron ore led India's list of mineral exports with about 13.9 million metric tons shipped in 1967, compared with 13.7 million tons in 1966. Continued expansion in exports was anticipated, but it was doubtful if a target of 25 million tons by 1970 would be reached as planned.

Japan remained the major consumer of Indian ores, taking 9.97 million tons, or over two-thirds of the total exported, with the balance going to East European countries, West Germany, and Spain. Minerals and Metals Trading Corp., of India, was reported to have signed a contract with the major Japanese steel companies to supply 8.55 million tons of basic grade ore at a price of $9.37 per ton f.o.b., 1.5 million tons of high grade ore at $9.90 to $10.40 per ton, and 300,000 tons of crushed ore at $4 per ton. The 3-year contract is subject to negotiation after the second year. A 7-year contract, beginning in 1970, was signed by a Goan company and the Fuji Steel Co., of Japan, for 4.75 million tons of ore in the form of lumps and fines at $5.65 and $4.45 per ton, respectively.

Limited facilities for iron ore handling at railroads and ports have been a serious handicap to expansion schemes. Ores are shipped through about 15 ports joined to several hundred mines by complex transportation routes. Facilities have been under gradual improvement to permit more economical transport.[4] To achieve large projected export increases, the Government has undertaken several large mining projects including the Bailadila, in Madhya Pradesh State, and the Kiriburu and Daitari, both in Orissa State, with plans to produce 4, 2, and 1.7 million tons per year, respectively.

Bailadila had produced some ore from surface accumulations by the end of 1967, of which about 250,000 tons was shipped to Japan. A 2,500-ton-per-day crushing and screening plant was placed in operation, the 300-mile rail line to the port of Visakhapatnam was completed, and priority was given to expanding port facilities. Formal opening of the mine was scheduled for November 1968 with the rate of mining to reach capacity by about 1971. Reserves have been estimated at 4,000 to 5,000 million tons. Generally, the ore is 65 percent or higher in iron and contains 0.85 percent silica, 1.46 percent alumina, and 0.042 percent phosphorus, with only traces of sulfur.[5]

Another large iron ore deposit recently discovered in Mysore State was believed to contain some 5,000 million tons of ore grading about 40 percent iron. A $600,000 project has been proposed to study feasibility of developing the deposit.

Iron and Steel.—Recession in the Indian economy, labor problems, and lack of demand in domestic metallurgical and fabricating industries resulted in buildups

[4] Rungta, Ajay Kumar. Export of Minerals—Problems & Prospects. Indian Min. and Eng. J., v. 7, No. 1, February 1968, pp. 9–10.
[5] U.S. Consulate, Bombay. State Department Airgram A–182, April 26, 1968, 4 pp.

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of unsold inventories at steel plants in 1967. Efforts were pressed to expand exports to offset the slump. Overall production of iron ore, pig iron, ingots, and ferroalloys was slightly lower in 1967 although there was an upsurge in exports, chiefly pig iron. Steel imports, in the form of semimanufactures, were higher. Imported steel accounted for about 10 percent of total Indian consumption, and came from many countries, although largest suppliers were the U.S.S.R. and Japan.

Operations at the three public sector plants of the Government's Hindustan Steel Ltd.—Bhilai, Rourkela, and Durgapur—were unsettled; nonetheless, plans continued under discussion to expand capacities and possibly build new plants. Hindustan Steel, producer of roughly half of the country's steel, sustained net losses of $27.2 million in 1966–67 and $53.2 million in 1967–68; such losses were attributed, in balance sheets at least, to unrealistically large interest and depreciation costs rather than to operational expense. It was acknowledged, however, that labor unrest and reduced demand were also factors.

Export sales of pig iron increased markedly but were understood to be stimulated by Japanese purchases at prices below the world market with the sales actually made at a net loss. About yearend, the U.S.S.R. was reportedly considering a 3-year contract to purchase 200,000 tons annually of merchant mill products from India. This would help support operations at the Soviet-assisted Bhilai project where progress has been only moderately successful, especially at the product and marketing end. Private sector plants of Tata Iron and Steel Co. and Indian Iron and Steel Co. continued to operate with relative efficiency. Although faced with most of the same problems, they made little progress toward expanding facilities under the existing circumstances.

Of the Government plants, Bhilai, in the Durg district of Madhya Pradesh, produced 1.85 million tons of ingot steel in 1967 utilizing ores from Rajhera. Capacity at Bhilai was raised to 2.5 million tons in mid-1967, and plans were submitted for an additional increase to 3.2 million tons. In all, the plant now maintains five 250-ton and five 500-ton open-hearth furnaces for steelmaking. Products in 1967 included 515,000 tons of rails and structural shapes, 317,000 tons of merchant bars and shapes, and 25,000 tons of wire rods. Bhilai products exported during the 1966–67 financial year totaled 174,000 tons of pig iron and about 55,500 tons of rolled products with a combined value of $10.8 million. At Rourkela, the second stage of the plan to increase capacity from 1 to 1.8 million tons annually, was nearing completion. A five-stand tandem mill capable of producing 650,000 tons of cold-rolled sheets per year was due for trial runs by February 1968. This second stage also will include a continuous galvanizing section and an electrolytic tinning line, both supplied by West German firms. Expansion from 1.6 to 3.4 million tons at the Durgapur plant, in West Bengal, was postponed pending market improvement.

The first private sector plant to produce special steels was about to become operational at Bombay. Under the name Mahindra Ugine Steel Co. (MUSCO), the $13 million plant is a joint venture of the Indian Mahindra group and French Société D'Electro-Chimie D-Electro-Metallurgie et des Aciéries Electriques D'Ugine. At capacity it will produce 34,000 tons of ingot or 24,000 tons of finished alloy, tool, and other special steels annually.

The Bokaro steel development was underway, construction having been initiated on the blast furnace section. U.S.S.R. financing and technical assistance was enlisted, and the first stage to produce 1.7 million ingot tons annually, was scheduled for completion by the end of 1971, with expansion to 5.5 million tons due later. Bokaro, the sixth major steel plant in India and ultimately the largest, was headed for a possible year's delay as work was temporarily suspended towards yearend because of the discouraging market situation.

Lead and Zinc.—Lead metal supplies in India consisted largely of imports in pig form and were considerably higher than in 1966. The only lead-zinc mine operating in 1967, was the Zawar mine, 25 miles south of Udaipur in Rajasthan. This mine belonging to the Government's Hindustan Zinc Ltd., has proved reserves of 8 million tons of ore grading 1.8 percent lead and 3.7 percent zinc with additional sizable tonnage of probable ore. Additions to the Zawar mill in 1967 expanded capacity to 750 tons of ore daily. A major devel-

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opment program has been planned including continuation of intensive exploration of nearby Balaria, Zawar Mala, Bawa, and Baroi Hills to provide adequate feed to the company's new zinc smelter at Debari, 25 miles away by rail. Additional production targets of 2,800 tons of ore daily by 1971 were proposed. Recoveries of lead concentrates at the Zawar mill continued to decline. All output was shipped by rail 1,200 miles to the company's Tundoo smelter near Dhanbad, Bihar.

In 1967 India became a zinc metal producer with initial operation in April of the private sector's Cominco Binani electrolytic zinc smelter at Alwaye, Kerala State. This event was coupled with the commissioning of the public sector's Hindustan Zinc Ltd. smelter at Debari, Rajasthan, in October. Indications were that by 1968 operations would be reasonably satisfactory although not at full capacity, which is 20,000 tons of electrolytic zinc, 45,000 tons of byproduct sulfuric acid, and 30 to 40 tons of cadmium annually. Initially, Canadian zinc concentrates are to be utilized. Acid is to be supplied to a 75,000-to-80,000-ton-per-year single superphosphate fertilizer plant located on the premises which utilizes phosphate rock from the United Arab Republic, Jordan, and Morocco.

Manganese.—Lack of export demand for manganese ore kept some of the approximately 400 existing mines from reopening after being put out of operation during heavy monsoon rains in 1967. Mine output declined and there was a noticeable trend toward lower grades of ore. About three-fourths of all Indian production is exported. The Indian export duty on manganese ores was reduced during the year from 20 to 12.5 rupees (about $2.67 to $1.67) per ton; however, mine owners expressed feelings that duties should be totally removed. Ore purchases since 1965 have been channeled through the Minerals and Metals Trading Corp. By yearend 1967, approximately 250,000 tons of ore had accumulated in stocks.

Ferromanganese was in a similar situation with growing stocks and lagging sales; production in the first 9 months of 1967 was 97,439 tons, versus 104,104 tons in the comparable period of 1966. Domestic consumption for the year was estimated at 80,000 to 90,000 tons, leaving the balance for export.

Mineral Sands.—Monazite occurs with beach sands in many parts of the Indian coastline. Deposits most suitable for exploitation are associated with ilmenite, zircon, garnet, rutile, sillimanite, and quartz at Chavara, near Quilon in Kerala State, and at Manavalakurichi, a coastal village in the Kanyakumari district of Madras State. Production of monazite in 1967 remained about the same as during fiscal 1966 (ending March 31) when output totaled 2,600 tons, and it was believed 1968 would see increases because of favorable trends.

Government-owned Indian Rare Earths Ltd. was the only monazite mining and processing firm in India in 1967, extracting rare-earth chlorides and producing trisodium phosphate and residues containing thorium and uranium compounds. The company completed modernization and expansion at its Manavalakurich, Madras, upgrading plant in June 1967 and was rebuilding its Chavara, Kerala, plant similarly. When completed, the two together should be able to produce 3,585 tons of monazite, 140,000 tons of ilmenite, 8,570 tons of rutile, and 10,600 tons of zircon annually.

Ilmenite production was higher in 1967, value totaling $217,333, but exports declined from those in 1966. Japan remained the foremost purchaser. Travancore Titanium Products Ltd., Kochuveli, Trivandrum, Kerala State, remained the only domestic consumer, producing about 6,500 tons of titanium dioxide pigment annually from about 14,000 tons of ilmenite. Plans were underway to expand capacity to 25,000 tons of pigment annually by 1970. Other ventures were still pending, including a project by Century Rayon Corp. of Bombay to join in construction of a complex in Kerala to produce titanium slag, tetrachloride, magnesium metal, titanium dioxide, sponge metal, chlorine, and pig iron. India's entire production of rutile was reported to have been consumed domestically in manufacturing arc-welding electrodes.

Silver.—Most of India's silver production (about 93 percent in 1967) was recovered from lead concentrates at the Tundoo smelter in Bihar; the remainder came from refining of gold. Generally production of silver is expected to follow

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the downtrend in output of lead because of the relationship. Exports officially reported in 1967 were valued at $601,866, and all went to the United Kingdom. A few hundred kilograms were imported.

NONMETALS

Cement.—India maintained self-sufficiency in cement in 1967 and had a small excess for export, which went chiefly to Nepal. Output gained nearly 650,000 tons over that of 1966, a total of 42 plants had combined capacity of 12.6 million tons, and in 1967, utilization of capacity was about 93 percent. Approximately 2.4 million tons of capacity was expected to come into production in 1968 at four new and seven existing plants. During the Fourth Plan period (1966–71), nine new plants with a total capacity of 2.8 million tons were due to be built.

Effective January 1, 1968, the Government-owned Cement Corporation of India Ltd. is to take over the distribution and price control of cement from the Cement Allocation and Coordinating Organization (CACO), an organization of private producers entrusted with these responsibilities after the decontrol of cement in January 1966. The Government has cited differences among CACO members concerning prices and alleged misuse of funds as reasons for this decision.

Fluorspar.—Domestic fluorspar mining has been insignificant, at least until the opening of the Ambadungar mine in the Chhota Udepur taluk of the Baroda district by the State Government's Gujarat Mineral Development Corp. in December 1964. According to Geological Survey reports, an exploration program has shown the presence at the Ambadunger mine of 4.7 million tons of measured recoverable fluorspar and 6.9 million tons of indicated and inferred reserves, with grades averaging 30 percent calcium fluoride but with significant tonnages grading up to 97 percent CaF_2. A modest program of selective mining was begun and, through 1967, the mine produced 2,400 tons of metallurgical-grade and 1,200 tons of acid-grade fluorspar by hand-mining methods and employment of jigs for upgrading. A 500-to 600-ton-daily-capacity mill has been planned, and $3.3 million was designated for construction and mining equipment with commissioning set for 1971. The plant is to have a 32,000-ton-capacity of acid grade and a 60,000-ton capacity of metallurgical-grade fluorspar annually.

Gypsum.—India is believed to have the largest reserve of gypsum in Asia estimated at 998 million tons but situated in generally unsuitable areas in relation to transport facilities. Thus, utilization and possible export are restricted. Of the total reserve, 934 million tons is located in the Barmer, Bikaner, Jaisalmer, Jodhpur, Nagaur, and Pali districts of Rajasthan. Production in 1967 was valued at $1.06 million, compared with $1.34 million in 1966. The Government-owned Sindri Fertilizers and Chemicals Ltd., at Sindri, Bihar, remained the country's only large consumer, using 650,000 tons grading 83 to 86 percent $CaSO_4 \cdot 2H_2O$ for manufacture of ammonium sulfate. Approximately 370,000 tons of gypsum was consumed in domestic portland cement, and plaster of paris and insecticides accounted for an additional 10,000 tons. The Nagaur district of Rajasthan was the only consistently producing region; about eight mines were in operation there during 1967.

Kyanite.—India's leading kyanite producer is the Indian Copper Corp. Its Lapsa Buru deposit in the Singhbhum district, Bihar, contributed virtually all of the country's output in 1967. The remainder came from a few small mines in Haryana, Mysore, Orissa, and Rajasthan States. Since 1960, domestic consumption of kyanite has grown. In 1967, eight firms were producing mullite bricks from kyanite, consuming about 8,000 tons during the year. Exports comprised about 80 percent of production. The price for grade 61 to 62 percent Al_2O_3 ranges $25.33 to $28.66 per metric ton, f.o.b. Calcutta.

Limestone.—Madhya Pradesh State is the leading producer of limestone followed by Orissa, Bihar, Rajasthan, Mysore, Andhra Pradesh, and Gujarat. Hindustan Steel Corp's Nandrini mine in the Durg district, Madhya Pradesh, has been fully mechanized; mechanization is underway at the Nadikude mine of Andhra Cement Co. in the Guntur district. The Bhawanathpur limestone deposit in Bihar is being considered for supplying the Bokaro, Rourkela, and Durgapur steel mills with 3.8 million tons annually from a fully mechanized mine.

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Magnesite.—Principal occurences of magnesite in India are in Madras, Mysore, and Uttar Pradesh States; however, a newly found deposit of unknown extent at Sendri, in the Pali district of Rajasthan, was worked for the first time in 1967. Readily minable deposits in Madras cover about 18 square kilometers between the town of Salem and the Shevaroy Hills; reserves have been estimated at about 45 million tons, all workable by open pit methods. Output of crude magnesite was valued at $630,266; after calcining it was consumed mainly by refractory producers.

Mica.—Bihar, Rajasthan, and Andhra Pradesh are India's chief mica-producing states. In 1967, India continued to be the world's leading producer of muscovite mica with reserves, although not calculated, believed to be sufficient to meet export demands for the foreseeable future. Overall mica production in 1967 as indicated by exports and estimates of consumption was valued at almost $20 million and included 1,607 tons of block mica, 5,527 tons of splittings, 92 tons of condenser film, and 13,947 tons of other mica. Domestic consumption of mica has been estimated at about 3,000 tons annually, including about 2,100 tons used in insulating bricks at the Bhupal Mining Works, Bihar. During 1967, mica remained subject to export controls imposed after devaluation of the Indian rupee in June 1966. Controls include 40 percent ad valorem duty on exports of all types and minimum export prices on blocks, splittings, condenser films, and scrap or waste.

Salt.—In 1967, human and animal consumption accounted for about 70 percent of the salt produced, chemical industries 15 percent, exports 5 percent, and other users the remainder. Exports valued at $1.1 million, were slightly less than in 1966, and went largely to Japan and Nepal. Japan reportedly contracted for significantly larger shipments of Indian salt in July 1967–June 1968. However, it appeared that limited port facilities for off-loading salt would restrict quantities and prevent fulfilling of Japanese purchases.

Sillimanite.—Sillimanite deposits of Sonapahar in the Khasi Hills of Assam are considered among the world's largest, with estimated reserves of 255,000 tons. Assam sillimanite averages 62 percent alumina, 35 percent silica, 1.25 percent iron oxide, and 0.15 percent titanium dioxide. Domestic consumption of sillimanite is estimated at about 5,000 tons annually, all for refractories. Exports declined sharply in 1967 and were valued at $185,327, compared with $588,579 in 1966.

Sulfur and Pyrite.—Demand for sulfur continued to rise and despite a poor resource position, efforts were redoubled to develop domestic sources and eliminate the cost of imports. During 1966, consumer requirements were estimated at 465,000 tons but supplies were only about half of that. The balance was improved in 1967, with imports fully satisfying demand. Projections place demand in 1970 at about 850,000 tons. Relief is expected to come through the recent commissioning of zinc smelters in Kerala and Rajasthan. This new capacity will produce about 75,000 tons of sulfuric acid annually. Relief will also come from a new petroleum refinery in Madras scheduled for completion in 1969 with sulfur recovery capacity of 18,000 tons annually. Other projects, including exploitation of the Amjhore-Ghogha pyrite deposits in Bihar and the Khetri Copper Project in Rajasthan, may provide about 409,000 tons of sulfuric acid annually by 1972. Pyrite deposits are known at Ingladhal, Mysore; Saladipura, Rajasthan; and Simla, Himachal Pradesh.

MINERAL FUELS

Coal.—Factors related to the failure of Indian coal production to expand according to plan included the change by railroads from coal to diesel locomotives, the loss of Pakistan as an export market, and lagging demand by the iron and steel industry and thermal electric powerplants. Coal output showed little change in 1967 despite new incentives to producers resulting from removal of long-standing Government price and distribution controls. Coal remained dominant in Indian minerals, nevertheless, providing almost three-fourths of the total value of all mineral production. India's overall resource position was excellent, although some coalfields were becoming more difficult to mine and supplies of coking coals were no more than adequate for domestic needs.

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The Bengal-Bihar coal region provided 70 percent of total coal production and all of the coking coal production, the latter amounting to about 16 million tons. Although collieries tried to keep some balance between supply and demand, accumulated stocks at the end of 1967 stood at an estimated 6 million tons, much of this being inferior quality coal. The country's overall mine capacity has been estimated at 90 million tons per year or roughly one-third in excess of demand. Lack of growth in coal consumption by railroads had been more or less predicted and was allowed for in Government planning; however, consumption for steel and power was 3 to 4 million tons behind respective goals. Pakistan, formerly the leading foreign market for Indian coal, was supplied chiefly now by mainland China, thus losing for India a potential outlet for 1 million tons annually. Coal exports in 1967 included 122,895 tons to Ceylon and 109,102 tons to Burma, 38 and 30 percent lower, respectively, than in 1966. Of over 800 colliers active in India in mid-1967, 64 produced on the scale of 25,000 to 50,000 tons per month, and only four produced in excess of 50,000 tons monthly.

Price-distribution controls on noncoking coals and price controls on coking coals were removed on July 24, 1967, after being in effect nearly 22 years. However, on the same day the Government asked the coal industry to increase wages according to recommendations of the Coal Wage Board. Producers were generally reluctant but finally consented to a 5-rupee ($0.67) per ton increase in the price of coal. The increase was not considered adequate to cover higher costs, however, and it was hoped that a new price formula, expected July 1, 1968, from an interministerial committee, would establish additional price allowances. The fact that the Government is the major consumer of coal gave it strong bargaining powers in setting purchase prices.

Petroleum.—Production of crude petroleum from fields in Assam and Gujarat States was nearly one-fourth higher than in 1966 and nearly double the 1965 output as the result of effective development activities carried out by the Government's Oil and Natural Gas Commission. Output of petroleum products by eight refineries, including four Government-owned, increased from 11.28 million metric tons in 1966 to 13.45 million tons in 1967. As of 1967, India's refineries were able to supply domestic needs for all petroleum products except aviation gasoline, superior grades of kerosine, such as used in jet aircraft, and lubricants. Domestic refineries continued to depend on foreign sources, specifically the Middle East countries, for nearly 60 percent of total crude oil requirements. During 1967, 72 percent of the aviation gasoline and 85 percent of the lubricants consumed were imported. Outputs of high-speed diesel fuel, furnace oil, motor gasoline, and naphtha exceeded consumption; surpluses were exported, earning about $18.7 million in foreign exchange. About 56 percent of all crude oil refined was processed by private sector refineries.

The major increase in public sector refining came from initial production by the Government-owned Cochin refinery located on the southwest coast. By the end of 1967, the first full year of operation, the Cochin refinery was working at close to the design capacity of 2.5 million tons annually. The plant, which had been partly financed by Phillips Petroleum Co. of the United States, went onstream in September 1966. Indian Oil Corp. Ltd. (Indianoil), the Government's refining and sales arm, also owns the Gauhati, Barauni, and Gujarat plants, of which only the Gauhati was reported operating near capacity. The others did not come up to expectations because of management and labor problems. The Gujarat refinery, which operated its second major unit commissioned in late 1966, was fed with crude provided by the nearby Ankleshwar oilfield. The U.S.S.R. assisted in building the refinery.

Esso Standard Refining Co. of India Ltd., reported increasing refining capacity at its Bombay plant in mid-1967 to 3.5 million tons per year. Construction continued on a new refinery near Madras, to be in operation by yearend 1968, which will have an annual capacity of 2.5 million tons, including 200,000 tons per year of lube base stocks. Participating in this with the Government, which held 74 percent equity, were the National Iranian Oil Co. and American International Oil Co. National Iranian, with a 13-percent equity, had signed a 20-year contract to supply 40,000 barrels per day of crude to the Madras plant. Indianoil was also set to

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manage a refinery in planning for Haldia near Calcutta, but details on progress were not available.

Lube India Ltd., a joint venture of Esso and the Indian Government, was scheduled to come into production with a 145,000-ton capacity special oils and lubricants plant about yearend 1970 at a site selected near the Esso refinery at Bombay. The construction contract was awarded to SNAM Progetti Ltd., an Italian firm. The plant was expected to save $6 million in annual imports of lubricants. Lubricants have been produced by only one other plant in the country, the Digboi refinery in Assam; however, plans were being made to produce certain types of lube oils in the near future at the Barauni refinery in Bihar State. Meanwhile, Indianoil signed a contract with Petrolexport of Rumania to continue purchases of lubricants amounting to 75,000 tons in 1968. Indianoil was also reported to have signed a contract to import 360,000 tons of kerosine from the U.S.S.R. in 1968.

In petroleum exploration, international groups were watching the Government actions closely in regard to offshore oil concessions in the Gulf of Cambay. Tenneco International Oil Co., of the United States, was competing with a French-West German-United States exploration group and with the U.S.S.R. for concession areas. It appeared at yearend that the U.S.S.R. might be awarded the shallower portions, whereas companies with more deepwater experience might receive those at greater depth.

Trial production was being conducted on 16 of 175 wells drilled in the recently discovered Kalol, Navagam, Rudrassagar, and Lakwa oilfields. Operations at the State-owned Ankleshwar oilfield and Cambay gasfield continued to be expanded, and further drilling was expected to be successful at Galeki in Assam. The Oil and Natural Gas Commission was expected to intensify drilling activities and explore several new areas in the coming year, including Aliabet Island at the mouth of the Narmada River, Pamban Island near Rameshwaram, the Tripura area south of the Garo Hills, Jammu, and Pilibhit. Geological studies were in progress in the Andaman and Nicobar Islands, both Indian possessions in the Bay of Bengal, to determine prospects for oil and gas.

Because of the clear domestic shortage of resources the Indian Government is participating in oil exploration abroad. Beginning in January 1965, a company was formed to explore in the Persian Gulf and, as of late 1967, there was evidence of a significant discovery in at least one of four concession areas off the Iranian coast. The company, Iranian Marine International Oil Co., is comprised of the Indian Oil and Natural Gas Commission, AGIP, Spa, which is associated with Italian Ente Nazionale Idrocarburi, and Phillips Petroleum Co. of the United States. Drilling was scheduled to continue in the discovery area and possibly on new concessions being offered by Iran. Meanwhile, the Indian Government tried to decide whether it was better to expand such efforts or invest large sums in exploring its own Gulf of Cambay.

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The Mineral Industry of Indonesia

By Arthur F. Grube [1] and J. M. West [2]

Broad new policies were adopted in Indonesia during the year in an effort to stimulate exploitation of mineral resources and to put new life into an ebbing economy. Crude oil again provided the major share of the country's mineral-related income, and tin, salt, coal, and cement most of the rest. About two-fifths of the petroleum produced was refined in Indonesia by the Government and by one U.S.-owned company, P. T. Stanvac Indonesia; the balance was exported in crude form. Indonesia's largest crude-oil-producing company, Caltex Pacific Indonesia, inaugurated a significant expansion program during 1967 after having received government permission to lower the price of crude oil to its customers, primarily Japan. Industries previously nationalized were returned to original owners, although it appeared that P. T. Shell Indonesia would remain in government hands.

The vagueness of Indonesian mining laws has been criticized by many potential investors. The Indonesian Government, conscious of this, was expected to enact a new mining law early in 1968. The Minister of Mining reportedly had under advisement a basic plan including the following provisions: A modified depletion allowance, to be called Mining Development Allowance, reducing the regular 60-percent corporate tax to various levels dependent on type of ore mineral; a depreciation rate of 12.5 percent annually, allowing writeoff of all capital goods in 8 years; tax holiday provisions that would reduce taxes 7 to 12 percent during the first 10 years of production; and imposition of modest land rent and royalty rates. Another proposal reportedly under study would abolish an existing export tax of 25 percent of the foreign exchange value imposed on mined metals.

Recent foreign investment legislation was discussed in a U. S. publication.[3]

Generally the outlook was good for Indonesian mineral development.. The oil situation was improved, and sizable expansions in output and development of reserves were forthcoming. It was believed that oil production might double within the near future as a result of the Government's encouragement of new foreign investment. Tin mining was expanded reflecting changes in management and better operation. A modern tin smelter began limited operations at Muntok, Bangka Island. Tin exploration is to be accelerated during the next few years, many companies having bid for various area rights. Further explorations for bauxite and nickel are projected, and a sizable copper orebody was demarcated in West Irian. Other copper deposits were studied in Sulawesi, and manganese is to be surveyed in Java.

Besides a number of specific areas allotted to selected internationally-known development groups, the Government in September 1967 announced an invitation to foreign mining companies to submit bids for 53 separate 10,000-square-kilometer blocks of potential mineral lands: 15 in Sumatra, 18 in Kalimantan, 1 in Java, 8 in Sulawesi, 10 in West Irian, and 1 in the Lesser Sunda Islands. Companies whose bids are accepted will receive an exclusive contract to carry out stipulated general explorations, and upon the discovery of commercially exploitable minerals, they will be granted a development contract. Oil, natural gas, and a few unspecified strategic minerals are not included. The foreign company is obligated to process and recover the valuable constituents of the ores in Indonesia. Contractors are expected to

[1] Industry economist, Division of International Activities.

[2] Physical scientist, Division of International activities.

[3] Webbert, M. Virginia. Summary and Texts of Indonesian Foreign Investment Legislation. U.S. Department of Commerce, Overseas Business Report 67-97, December 1967, 19 pp.

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provide the Government with progress reports, and on termination of the contract a full geological report, including a 1:250,000 or larger scale geologic map. As of January 1968, about 20 offers had been received.

Indonesia's electric power capacity of about 910,000 kilowatts of 2.2 billion kilowatt hours failed to satisfy demand. Known planned expansion was equal to less than 3 percent of the existing capacity.

PRODUCTION

Crude oil, tin, bauxite, and nickel ore production increased in 1967, but coal output was significantly lower due to cutbacks in railroad purchases. Further increases in metallic tin output were forthcoming as the new smelter at Muntok becomes fully operative. Firm data were not available on a number of mineral products.

Table 1.—Indonesia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Bauxite	493,111	647,805	688,259	701,223	912,266
Gold [1] troy ounces	4,437	5,813	6,752	4,122	7,752
Lead	-------	650	NA	NA	NA
Manganese ore	2,845	500	r 415	NA	NA
Monazite sand	153	140	25	NA	NA
Nickel ore (3.5 percent nickel)	45,705	47,950	r 102,002	117,402	170,601
Silver thousand troy ounces	280	r 253	299	221	309
Tin:					
Concentrate, metal content long tons	12,947	16,345	r 14,698	r 12,567	13,600
Metal do	e 2,000	e 1,800	e 1,800	1,510	e 3,000
Nonmetals:					
Asbestos	70	-------	-------	-------	-------
Cement thousand tons	330	439	365	338	e 350
Diamond carats	NA	NA	e 2,000	e 3,000	e 3,000
Iodine (content of cuprous iodide) kilograms	4,983	4,904	1,642	NA	NA
Phosphate rock	1,125	3,408	NA	NA	NA
Salt:					
Government (reported) thousand tons	449	NA	252	e 250	e 250
Private (estimated) do	NA	NA	NA	NA	NA
Sulfur	1,050	1,695	r 1,288	e 1,200	e 1,200
Mineral fuels:					
Asphalt rock	10,489	5,315	9,080	e 10,000	e 10,000
Coal	491,610	445,862	390,253	r 319,829	208,363
Petroleum: [2]					
Crude thousand 42-gallon barrels	r 166,885	r 171,492	r 178,991	r 168,429	e 185,000
Refinery products:					
Gasoline thousand 42-gallon barrels	15,550	14,142	e 13,685	10,600	e 10,344
Kerosine and jet fuel do	12,836	11,000	e 9,846	13,000	e 13,419
Distillate fuel oil do	10,044	10,716	e 9,987	10,800	e 8,741
Residual fuel oil do	18,338	12,581	e 15,000	11,800	e 10,784
Other [3] do	17,861	15,983	e 25,343	20,415	e 20,704
Total [4] do	74,629	64,422	e 73,861	66,615	e 63,992

e Estimate. r Revised. NA Not available.

[1] Officially reported Indonesian statistics representing government output; private production by small unorganized producers may be as much as 30,000 troy ounces per year.

[2] Indonesia also produces significant quantities of natural gas but production data are not available.

[3] Includes unfinished oils requiring further processing.

[4] Excludes refinery fuel and losses.

TRADE

Mineral commodity exports remained highly important in Indonesian trade, contributing nearly one-half of the total value of 1967 exports. Petroleum alone accounted for about one third of all export earnings. Mineral commodity imports, on the other hand, accounted for only 5 to 10 percent of the total value of all imported goods.

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Petroleum was to play an expanding role in exports in 1968–69, with particularly good markets anticipated in Japan and the United States. Tin concentrate continued to go mainly to the Netherlands for refining, but early in 1968 some was to be shipped to Penang in Malaya.

Despite Indonesia's other economic difficulties, in recent years, the nation has achieved a generally positive balance of trade through rigid import controls and maintenance of mineral exports; estimated value of total foreign trade has been as follows; in millions of dollars:

Year	Exports	Imports	Balance
1963	696	502	194
1964	724	622	102
1965	708	718	−10
1966	679	583	96

Cement totaling 40,178 metric tons was shipped to Indonesia from Japan in 1966; Japanese shipments during the first 11 months of 1967 rose to 73,024 tons (other suppliers undetermined). During 1966 Japan also supplied Indonesia with 35,664 tons of iron and steel products and about 850 tons of nonferrous base metals and alloys. Measures were being discussed in 1967 to improve and simplify Indonesian trade procedures.

Table 2.—Indonesia: Exports of selected mineral commodities to Japan [1]

(Metric tons unless otherwise specified)

Commodity		1965	1966	1967
Metals:				
Bauxite		563,952	603,760	771,648
Iron and steel scrap		1,000	1,486	17,843
Manganese ore		5,293	2,106	7,176
Nickel ore and concentrate		79,450	133,653	128,455
Petroleum:				
Crude oil	thousand 42-gallon barrels	38,856	38,889	47,477
Distillate fuel oil	do	447	453	440
Residual fuel oil	do	2,466	3,454	4,929

[1] Data shown in lieu of official Indonesian export figures.

Source: Official trade returns of Japan.

Table 3.—Indonesia: Trade in selected mineral commodities, 1965 [1]

Commodity	Quantity (metric tons)	Value (thousand dollars)	Source or destination
Exports to Indonesia:			
Iron and steel	NA	30,341	Mainly from Japan, France, Belgium-Luxembourg.
Nonferrous metals	NA	6,176	Mainly from Yugoslavia, West Germany, and Austria.
Asbestos	432	53	Italy.
Cement	280,026	3,888	Mainly from Japan.
Sulfur	5,049	252	West Germany, Canada.
Petroleum and products (mostly lubricants)	NA	8,706	Mainly from United States.
Imports from Indonesia:			
Bauxite	591,862	5,391	Japan, West Germany.
Manganese ore	5,293	120	Japan.
Nickel ore	79,450	1,364	Japan.
Tin ore and concentrate	18,185	49,229	Netherlands.
Petroleum and products	NA	e 272,000	Japan, Australia, United States, and Philippines.

e Estimate. NA Not available.

[1] Derived from United Nations data on countries trading with Indonesia; represents bulk of mineral trade but does not cover trade with Communist countries.

COMMODITY REVIEW

METALS

Aluminum.—Bauxite production from Bintan and adjacent islands continued to expand in 1967. Japan, as in the past, was the destination for nearly all output. Three Japanese aluminum refiners about yearend 1967 obtained rights to explore Bintan for 2 years in search of new deposits. The Japanese have indicated that if there are upwards of 40 million metric

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tons of low grade bauxite, they will be prepared to construct an alumina refinery at a cost of about $30 million. Bintan, which is currently producing over 700,000 tons per year, is already known to have 20 million tons of reserves.

Aluminum Company of America (ALCOA) was reported negotiating with the Indonesian Government for exploration rights covering other areas of Indonesia but at yearend there was some doubt as to whether negotiations would be continued. ALCOA was considering the economic feasibility of establishing mining, processing, and smelting facilities in Indonesia. Kaiser Aluminum Corp. was reported interested in a joint venture with Japanese firms. Construction had not begun by yearend on a smelter project proposed by the U.S.S.R. in the Belawan area near Medan, northern Sumatra.

Copper.—A Yugoslavian team reportedly has discovered some 10 million tons of copper ore containing 1.5 to 2 percent copper in the Sankaropi area of central Sulawesi. Ore bodies have been explored to a depth of about 750 feet. It was undetermined if further work would be conducted by the Yugoslavians, who held a production sharing contract with the Government.

Freeport Sulphur Co. (United States) received rights in April 1967 to explore and develop a copper deposit in the Ertsberg area of the Carstensz Mountains of West Irian. Reports indicated that the ore body is relatively rich, in the outcrop at least, and contains considerable magnetite which could constitute a secondary product. Preliminary drilling reportedly outlined an ore zone on the order of 25 million tons grading about 2.5 percent copper, and a second phase of exploration was being planned. Supplies and equipment must be brought in by helicopter, but establishment of roads, towns, and port facilities was underway.

Iron and Steel.—The Soviet-assisted Tjilegon iron and steel project in western Java, approximately one-third completed, was at a standstill early in 1967; but plans were made to get the rolling mill sections into operation, using imported steel billets and slabs.

P. N. Barata, the country's largest nonmilitary metal fabricator, operated in 1967 at only about one-third capacity because of lack of product demand. The main plant in Surabaja reportedly has four cupola furnaces with 1,600-ton-per-year total capacity for cast iron and two small bessemer converters for cast steel.

A plan was disclosed to build two electric scrap-melting furnaces in the Medan area of North Sumatra to produce steel ingots and billets for a 121,000-ton-per-year rolling operation. Eventual installation of a second pair of furnaces and a 109,000-ton-per-year tube mill for pipe products was envisioned.

Manganese.—About yearend 1967 Union Carbide Corp., a U.S. company, was reportedly negotiating a contract to survey all of Java for manganese, with provision for exploitation if suitable deposits are found.

Nickel.—Output and exports of nickel ore from the Pomalaa and Mantang Island areas of southeast Sulawesi rose sharply in 1967 as a result of expansions by Sulawesi Nickel Development Co. (Japan) which holds a production-sharing contract with the Government firm, Indonesian Nickel Mining Corp. In May 1967 a new invitation was issued by the Government for nickel-mining investment, including the Malili area of central Sulawesi, the islands of Waigeo and Halmahera, and West Irian. Subsequently, a contract was signed with The International Nickel Co., Ltd., covering the Malili deposits. United States Steel Corp. was reported interested in Waigeo Island deposits and those near Sukarnopura in West Irian.

Tin.—Production increased from the 1966 low, and the outlook for Indonesian tin grew more optimistic. One of the world's large new dredges, Bangka I, contributed increasingly to overall output, working offshore from Sungailiat, Bangka Island. A group of small new West German-built dredges was also in operation, although their light construction caused some initial difficulty. Various repairs to other equipment were completed, and disruptions because of labor disputes declined.

Early in 1967 the new tin smelter at Muntok, on Bangka began trial operations but shortly after start-up, furnace linings crumbled, reportedly because of the long construction period and improper break-in. The smelter is expected to operate considerably below its 25,000-tons-per-year capacity for several years. The $3.5 million

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plant was built by Klöckner Industrie Anlagen (West Germany). As of yearend 1967 an estimated 1,500 long tons of tin metal had been produced by the new Muntok plant, with about an equal amount from the old and outmoded Puput smelter, also at Muntok. Most of this tin was marketed in Europe and included substantial tonnages which went to the U.S.S.R. Tin slags from an estimated accumulation of 25,000 tons at the old smelter site were being shipped to Singapore, presumably en route to other destinations. Such slags generally contain on the order of 5 to 10 percent tin and significant quantities of columbium and tantalum.

A number of agreements had either been confirmed or were under negotiation at yearend 1967 for rights to prospect and tentatively develop tin properties. Offshore deposits attracted many applicants. Particularly favorable were areas between Bangka and Billiton Islands, north of Bangka, and east of Billiton. Among contenders for these areas were the Billiton Co. (Netherlands) and a consortium of Charter Consolidated, Ltd., (United Kingdom), Broken Hill Pty. Co. Ltd. (Australia), and Ocean Science & Engineering Inc. (United States). Late in 1967 the Japanese firm, C. Itoh & Co., Ltd., received rights to explore and develop tin in the Bangkinang area of central Sumatra, and a consortium of Bethlehem Steel Corp. (United States), Rio Tinto Corp., Ltd. (United Kingdom), Simons-Lobnitz, Ltd. (United Kingdom) was awarded a contract covering preliminary surveys of the Singkep, Karimun, and Kundur Islands, south of Singapore.

NONMETALS

Cement.—The Gresik cement plant, in eastern Java near Surabaja, operated at about 70 percent of its 375,000-ton-per-year capacity. Its production in 1966 totaled 228,500 tons. A cement research center was to be established at Gresik and the addition of a fourth kiln to boost capacity to 500,000 tons was planned. The plant at Padang in western Sumatra operated near capacity in 1966 and probably continued about the same level in 1967. French investors reportedly offered funds to quadruple this plant's capacity. The Czechoslovakian-built 120,000-ton Tonasa cement plant near Makasar in Sulawesi was being rebuilt after having burned in late 1967.

Diamond.—The first lot of rough diamonds, comprising several thousand carats and produced by the Amsterdam firm Asscher Diamond Company, Ltd., in southern Kalimantan, was shipped to Amsterdam, Netherlands, for cutting. A large share of the diamonds was said to be of gem quality. The diamond fields, reported to have good potential, were being exploited under a contract with the Indonesian Government, and operations were due to expand on arrival of additional mining equipment.

Fertilizer Materials.—The only operating chemical fertilizer plant in Indonesia was the urea plant of P. N. PUSRI, which operates under the Directorate of Chemical Industry in the Ministry of Basic and Light Industry and Power. Production from this plant at Palembang, South Sumatra, is based on natural gas feedstock and was believed to be about the same as the 93,015 tons produced in 1966. Plans were under consideration for major expansion, as much as fourfold, but there was a serious question about adequacy of local natural gas supplies to sustain such an increase.

At Gresik, eastern Java, the $56.1 million Petrokimia fertilizer plant, under construction by the Italian firm, Cosindit S.p.A., had further difficulties, delaying completion. At yearend, although about $24 million had been spent, no permanent buildings were completed but a large part of the equipment had been delivered to the site, and the prospect was that the plant might be operational by 1970.

Allied Chemical Corp. (United States) filed letters-of-intent for a $30 million investment to construct and operate a fertilizer mixing and conversion plant with capacity of about 400,000-tons-per-year using imported raw materials, including anhydrous ammonia, phosphoric acid, ammonium sulfate, and urea, from the Shahpur Chemical Corp. of Iran. The target date for completion is 1970.

MINERAL FUELS

Asphalt.—Although rock asphalt continued to be mined from deposits on the island of Butung, south of Sulawesi, oil refineries supplied the main demand. The country's largest asphalt plant is the 35-year-old Permina Unit III in the Surabaya suburb of Wonokrumo. In 1967 this plant produced 45,000 tons and the 1968 target

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is 80,000 tons. Feedstock was chiefly from th Tarakan area wells in Kalimantan.

Carbon Black.—P. N. Permina produced carbon black from natural gas at Rantau, North Sumatra. Plant capacity was 7,000-tons-per-year.

Coal.—Conditions in the coal industry continued to worsen during 1967 with no prospect for improvement, nor did the Government announce plans for any rehabilitation. During 1967, the principal coal consumer, the railroads, decided to convert to diesel engines, and by July, Javanese railroads, comprising more than 80 percent of all rail operations, ceased their coal purchases. As a consequence coal production has been cut to below 200,000-tons-per-year.

Petroleum.—In 1967, the tempo of petroleum industry activity continued the upturn started late in 1966, reflecting the improved climate for foreign investment. Crude oil production increased by an estimated 10 percent in 1967, and additional foreign-owned companies obtained petroleum exploration-development contracts covering both onshore and offshore areas of the country. Customarily in recent years, these agreements have taken the form of contracts between foreign-owned oil companies and the State-owned petroleum company, Permina. Under this system, the foreign contractor supplies the required capital for exploration and for this he receives roughly 40 percent of the crude oil subsequently produced, until he has recovered his exploration expense. The remaining 60 percent of production is shared between foreign oil company and Permina. After the foreign contractor has recovered initial expenses, the profit-sharing ratio becomes roughly 60–40, with Permina receiving the larger share.

P. T Caltex Pacific Indonesia's 1967 estimated crude oil production of 360,000-barrels-per-day probably represented about 70 percent of the country's total output About 250,000-barrels-per-day originated from the company's Minas oilfield the Duri and Bekasap oilfields each accounted for 30,000 to 40,000-barrels-per-day; and the remainder was from the Pematang and Pungit fields. The company has announced plans aimed toward doubling production by 1969; this was made possible by the Government's acquiescence to reduce the company's crude oil prices. This should enable the company to expand its crude oil market, particularly in Japan. P. T. Stanvac Indonesia maintained production of about 55,000-barrels-per-day from its Sumatran oilfields; and the South Sumatra, Kalimantan, and Java fields operated by Permina (formerly Shell properties) accounted for about 65,000-barrels-per-day. The remaining crude oil production came from Asamera (Indonesia) Co.'s recently discovered Geudondong oilfield in Sumatra and North Sumatra fields—Palu-Tabuhan and Rantau—operated by Permina's Japanese contractor, North Sumatra Oil Development Cooperation Co.

Six of the country's seven refineries and two asphalt plants were operated by Permina in 1967. These facilities included: the former Shell refineries at Balikipan, Kalimantan, and Pladju, Sumatra; the former Shell asphalt plant at Wonokromo, Java; and the Tjepu, Java, refinery formerly controlled by another Government company (Permigan). The remaining three refineries are at Langsa, Pangkalansusu, and Rantau; and the second asphalt plant is at Pangkalanbrandan, all in Sumatra. These latter three refineries and the one asphalt plant were built with equipment and materials salvaged from P. T. Shell Indonesia's former refineries in northeastern Sumatra, all of which were demolished during World War II. Permina was assigned sole responsibility for operation of government-owned refineries and oilfields by the Reorganization Decree of July 1966. The seventh refinery located at Sungaigerong, Sumatra is owned and operated by P. T. Stanvac Indonesia. The Government company Pertamin, in accordance with the decree, has exclusive domestic marketing rights. The third government company, Permigan was abolished in March 1966.

In December 1967, Permina signed a basic agreement with two Japanese firms, Far East Oil Trading Co. and Sumitomo Shoji Kaisha Co., Ltd., for the construction of a 100,000-barrel-per-day refinery at Dumai in central Sumatra to process crude oil from P. T. Caltex Pacific Indonesia's Minas oilfield. The Far East Oil Trading Company is a joint Japanese-Indonesian company formed to market Permina oil in Japan. Continental Oil Company, a United States firm, has proposed building a refinery at Dumai with a capacity of 50,000-barrels-per-day.

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The Mineral Industry of Iran

By David A. Carleton [1]

Long the sinew of Iran's economy, the petroleum industry in 1967 was strengthened by the 23 percent increase in crude oil production over that of 1966. The potential for improving the position of other minerals in the economy was indicated by recent, successful mineral exploration activity. As a result, current development programs and projects have placed Iran on the threshold of expanded mineral production and increased exports and industrial activity. Included are mineral commodities such as chromite, iron ore, lead-zinc, bituminous coal, aluminum, and copper.

Flourishing for the third consecutive year, the economy of Iran added an estimated 11 percent to its gross national products (GNP) during 1967, bringing the average economic growth for the past 15 years to 6 percent annually. Based on current prices, total GNP was an estimated $7 billion in 1967; per capita GNP averaged about $270. Although Iran appears to be leaving the ranks of the less developed nations, fundamental problems exist involving the continued reliance on oil revenues and the unbalanced geographical distribution of national income. More than half of the Government income, three-fourths of the foreign exchange receipts, and nearly 90 percent (by value) of total exports are provided by petroleum. Furthermore, economic development under the Third Plan (September 1962-March 1968) was two-thirds financed by petroleum revenues. During each of the three long-term development plans, expenditures were concentrated on the social and economic infrastructure such as housing, schools, hospitals, agricultural services, transportation and commuication facilities, and power projects. In the Fourth Plan, to begin in March 1968, the industrial and mining sectors will receive special attention, including the construction of Iran's first steel mill, a long-cherished national aspiration. Additional construction will include several nonferrous, basic metal smelting plants, a natural gas line to the U.S.S.R., new oil refineries, and other heavy industry developments. The industrial sector is to receive 26 percent of the plan's total allocation, which is expected to enable a 13- to 15-percent increase per year in industrial output.

PRODUCTION

Except for petroleum and natural gas, the latest official statistical survey of mineral production in Iran was undertaken in 1963 by the Ministry of Economy. Published production data since then have been based on unofficial estimates by the Ministry. For the past few years reported production statistics are admittedly nothing more than "guesstimates". In general, metal and nonmetal production since 1963 has increased significantly as Iran has better utilized its mineral resources. Reported decreases in production of some minerals, especially barite and chromite, may reflect a downward adjustment of the unofficially reported estimates and may not necessarily represent real reductions in mineral output.

Although definitive data are not available, the Ministry of Economy has estimated that production of Iran's five major metal ores, chromite, copper, lead, manganese, and zinc, was valued at an equivalent of $9 million in 1966. The Ministry's estimate of crude oil production value,

[1] Supervisory foreign mineral specialist (Petroleum), Division of International Activities.

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apparently based on posted or reference prices, was $1.2 billion in 1962,[2] compared with the 1967 reference price value of $1.6 billion.

Table 1.—Iran: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Chromite	100,000	120,000	150,000	175,000	141,000
Copper ore (3 to 4 percent copper)	5,200	5,200	8,835	11,000	11,000
Iron ore thousand tons	r 20	r 21	r 59	80	NA
Lead:					
Content of ore	10,000	15,000	17,000	20,000	22,000
Ingots (smelter output)	500	375	400	400	350
Manganese ore	15,000	32,000	34,000	38,000	41,100
Zinc, content of ore	10,000	15,000	15,000	17,000	24,000
Nonmetals:					
Barite	20,000	72,000	72,000	72,000	52,000
Cement, hydraulic thousand tons	745	745	785	1,394	1,394
Ochre	8,700	9,000	10,000	8,800	NA
Salt thousand tons	345	345	345	220	250
Sulfur [2]	20,000	r 20,000	r 20,000	r 25,000	25,000
Mineral fuels:					
Coal thousand tons	200	200	274	280	284
Coke do	20	20	20	20	21
Natural gas million cubic feet	364,928	415,400	509,900	632,456	709,238
Marketed [3] do	40,884	42,102	43,423	48,957	51,784
Petroleum:					
Crude thousand 42-gallon barrels	538,107	618,731	r 688,213	771,234	947,678
Refinery products:					
Aviation gasoline [4] thousand 42-gallon barrels	4,970	5,035	6,359	6,502	6,316
Motor gasoline [4] do	13,915	12,758	12,300	16,730	15,674
Naphtha and solvents [4] do	6,571	6,604	5,004	1,669	2,859
Jet fuel do	7,286	7,497	9,763	10,564	10,266
Kerosine do	r 14,486	r 16,681	15,378	15,317	15,778
Distillate fuel oil do	r 22,261	r 21,107	22,035	23,411	23,657
Residual fuel oil do	60,611	66,229	68,092	70,589	74,720
Lubricants do	178	247	306	364	323
Asphalt do	1,078	1,227	1,105	1,376	1,877
Liquefied petroleum gas [4] do	112	154	199	294	440
Other [4] do	34	29	35	26	25
Total do	r 131,502	r 137,568	140,576	r 146,842	151,935

r Revised. p Preliminary. NA Not available.
[1] Estimated except for natural gas and petroleum.
[2] Excludes sulfur occurring in the natural gas produced but eventually flared or otherwise wasted.
[3] Used as fuel or raw materials.
[4] All figures revised except 1967.

TRADE

Petroleum continues to be the principal export commodity of Iran. Exports of crude oil and refined petroleum products totaled $1.2 billion during the Iranian year ending March 20, 1967 accounting for 89 percent of the total value of exports. Western Europe and Japan are the principal destinations for petroleum exports, with the Japanese market experiencing the most growth. The trading companies of Iran's largest petroleum operation accounted for 95 percent of total petroleum exports, of which 37 percent was destined for Western Europe and 34 percent for Japan. Petroleum exports to Japan have tripled since 1964. Exports of metal and nonmetal ores were valued at about $11 million in 1967 of which about $9 million was for metal ores. Iron and steel products are the principal mineral commodities imported. For the first 10 months of the Iranian year beginning March 21, 1966, iron and steel imports totaled $142 million, about 15 percent of the value of all imports during that period.

[2] Ministry of Economy. Trends in Industrial and Commercial Statistics. Tehran, October 1967, p. 23–24.

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Table 2.—Iran: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Chromite, 48 percent Cr_2O_3	159,850	131,825	France 38,550; Italy 30,400; Japan 26,250.
Copper, all forms	203	160	Kuwait 106; West Germany 39.
Iron and steel:			
Scrap	5,200	7,241	Japan 4,826; Iraq 1,500; Kuwait 915.
Semimanufactures	117	166	Afghanistan 113.
Lead and alloys:			
Ore and concentrate	51,551	44,935	U.S.S.R. 32,677; Belgium 7,308; United Kingdom 4,950.
Ingots and scrap	47	-------	
Manganese ore	35,102	39,800	Norway 12,700; Netherlands 7,100; Czechoslovakia 6,300.
Zinc ore	97,789	77,547	U.S.S.R. 18,569; Belgium 15,168; Japan 14,100.
Nonmetals:			
Barite, natural	-------	1,120	All to Kuwait.
Cement	128,509	92,593	Kuwait 78,844; Muscat and Oman, 12,150.
Chalk	37	14	Afghanistan 13.
Clay	1,118	3,292	Dubai 2,476; Kuwait 796.
Fertilizers	5,654	569	Republic of South Africa 564.
Gypsum	3,500	2,591	Kuwait 2,047; Dubai 301; Muscat and Oman 243.
Lime	20	-------	
Ochre and earth colors	9,960	10,469	France 5,200; United Kingdom 4,309.
Salt	3,606	2,047	Kuwait 771; Muscat and Oman 677; Dubai 465.
Stone, dimension:			
Marble	330	3,634	Italy 2,082; Japan 1,075.
Other	5,326	4,880	Japan 1,615; Kuwait 1,202; Italy 1,455.
Stone, crushed	12,052	32,286	Kuwait 21,430; Muscat and Oman 2,397.
Mineral fuels:			
Coal and lignite	307	375	Iraq 296; Kuwait 79.
Petroleum:			
Crude oil [2]			
thousand 42-gallon barrels	534,785	619,012	Japan 173,710; West Germany 53,617; Italy 40,395.
Refinery products:			
Aviation gasoline do.	5,910	6,885	Singapore 2,370; Australia 514.
Motor gasoline do.	11,109	14,766	Singapore 2,882; United Kingdom 2,034; Australia 1,955.
Jet fuel do.	8,123	9,851	Singapore 2,919; United Kingdom 1,227; United Arab Republic 700.
Kerosine do.	4,459	3,889	Republic of South Africa 1,029; Singapore 933; Mozambique 650.
Distillate fuel oil do.	10,678	11,633	Singapore 1,463; United Kingdom 1,194; Republic of South Africa 752.
Residual fuel oil do.	52,796	52,623	Japan 13,872; United Kingdom 6,956; French Somaliland 4,623.
Solvents do.	961	950	Republic of South Africa 305; Singapore 228; Hong Kong 110.
Asphalt do.	232	448	Muscat and Oman 76; Mozambique 59; Tanzania 47.
Other do.	-------	1,268	Republic of South Africa 614; United Kingdom 242; Mozambique 237.
Total do.	94,268	102,313	

[1] Data for Iranian calendar years beginning March 21 of year indicated unless otherwise specified.
[2] Calendar year data as reported by the National Iranian Oil Company.

Source: Foreign Trade Statistics of Iran.

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Table 3.—Iran: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys:			
Ingots	3,035	6,146	United States 2,285; Norway 1,813.
Semimanufactures	1,578	2,071	Japan 340; West Germany 311; Yugoslavia 262.
Copper and alloys:			
Ingots	1,026	428	Mozambique 406.
Semimanufactures	3,567	3,764	Yugoslavia 1,431; West Germany 678; Chile 499.
Gold, troy ounces	611	32,507	United Kingdom 32,376.
Iron and steel:			
Cast iron and ferroalloys	21,238	9,684	U.S.S.R. 7,726; West Germany 969.
Scrap	6,068	4,376	Kuwait 2,582; Oman 974; West Germany 549.
Ingots	274	581	Austria 257; Japan 131.
Semimanufactures	698,973	747,580	West Germany 248,305; United Kingdom 92,641.
Lead and alloys:			
Ingots	1,064	2,700	Peru 564; Netherlands 448; West Germany 427.
Oxides	207	211	West Germany 84; Italy 50; United States 38.
Semimanufactures	535	679	West Germany 515; France 96.
Nickel, all forms	141	189	Italy 138; West Germany 26.
Platinum, troy ounces	1,304	1,823	United Kingdom 1,316.
Silver, do	1,157	142,653	United Kingdom 112,913; United States 22,988.
Tin and alloys:			
Ingots, long tons	264	236	Malaysia 188.
Semimanufactures, do	221	310	United Kingdom 192; Sweden 54; West Germany 44.
Titanium	421	652	West Germany 319; United Kingdom 140; United States 131.
Zinc and alloys:			
Zinc oxide	495	446	Netherlands 249; United Kingdom 71.
Semimanufactures	567	1,098	Belgium 288; Australia 226; Mozambique 200.
Nonmetals:			
Abrasives	982	1,050	West Germany 342; Denmark 307; United Kingdom 181.
Asbestos	3,463	5,009	Canada 3,974; Republic of South Africa 899.
Cement, thousand tons	20	116	U.S.S.R. 85; Japan 9.
Clay	36,824	12,507	Italy 4,991; Brazil 2,500; France 1,116.
Fertilizer materials:			
Nitrogenous	8,115	7,288	Kuwait 5,500; U.S.S.R. 1,496.
Phosphatic	19,200	37,901	Morocco 11,736; Belgium 8,221; Tunisia 3,900.
Potassic	24,194	28,183	West Germany 18,117; Italy 3,376.
Mixed	4,183	5,078	West Germany 3,000; U.S.S.R. 850.
Graphite	45	36	West Germany 12; Japan 10; United Kingdom 10.
Mica, all forms	583	281	United Kingdom 150; West Germany 53.
Sulfur	148	3,777	United States 3,449; West Germany 318.
Talc	150	164	Norway 40; United Kingdom 38; mainland China 32.
Mineral fuels:			
Petroleum refinery products:			
Lubricants			
thousand 42-gallon barrels	14	23	United States 14; United Kingdom 7.
Other, do	19	23	United Kingdom 8; mainland China 5; United States 3.

[1] Data for calendar years beginning March 21 of the year indicated.

Source: Foreign Trades Statistics of Iran.

COMMODITY REVIEW

METALS

Aluminum.—In December 1967, the Iranian and Pakistani Governments and the Reynolds Aluminum Company agreed to construct a $45 million aluminum smelter at Ahwaz. The resulting Iran Aluminum Company, scheduled to begin production in 1971, is reportedly owned 65 percent by Iran, 25 percent by Reynolds, and 10 percent by Pakistan. Plans call for a smelter to produce 45,000 tons of ingot per year.

Chromite.—An accelerated highway construction program and the opening of new port facilities at Bandar Abbas have considerably reduced the cost of transporting and shipping chromite ore from Iran's south-central mines. The improvement of other roads near the mines and port will, when completed, further reduce costs. This improved infrastructure together with the favorable world chromite market, provides the two principal private companies, Esfandagheh Mining Co. and Farayab Min-

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ing Co., an excellent opportunity to increase production and exports. At yearend the latter company planned to increase production at the Shahriar and Amir mines from the present 6,000 tons per month to 10,000 tons per month during 1968. Reserves at these two mines have been set at 1.7 million tons; the ore is 40 to 50 percent chromite.

Copper.—A limited amount of copper has been produced for years from the small nickel-copper occurences near Anarak (east of Isfahan) and in northwestern Iran. During 1966 and 1967 extensive deposits of disseminated porphyry copper were identified in south-central Iran and at yearend 1967 three occurences were being studied. The most advanced project involves the Sar Chashmeh deposits (110 kilometers southwest of Kerman), where the Kerman Mining Company, an Iranian firm, has entered into a joint exploration and examination venture with an Iranian subsidiary of Selection Trust, Ltd., a British company. The appraisal work which will be carried out at Selection Trust's expense should take 2 years. Ore reserves were initially evaluated at a minimum of 30 million tons of 1.5 percent copper with the possibility that deposits could measure as much as 300 million tons averaging 1.0 percent copper. Successful exploration will be followed by open pit mining at a rate of 10,000 tons per day. Tentative plans are to establish smelting facilities in the area for the production of blister copper.[3]

The two other principal copper projects are the deposits at Midouk, 80 kilometers east of Rafsinjan, being investigated by Parjam Mining Company, an Iranian firm, and the mineralized properties of the State Mining Company, 80 kilometers east of Sirjan in south-central Iran.

Iron and Steel.—During 1967, Iran's first steel-rolling mill was completed near Ahwaz. Just prior to the completion of this 65,000-ton-per-year plant, the owner, Navard Iran Company, contracted to have the builder construct an adjacent 85,000-ton-per-year plant. When the second unit is completed (scheduled for March 1968) the mill will be capable of producing 150,000 tons per year of angles, sheets, rods, and strips, which should be worth about $25 million and should save a comparable amount in foreign exchange each year. Equity in the Navard Iron Company is as follows: Rezai Brothers, Iranian industrialists, 40 percent; Philipp Brothers, a division of the U.S. firm Engelhard Minerals and Chemicals Corporation, 32.5 percent; an Iranian development bank, 15 percent; Demag A.G., a West German company, 7.5 percent; and private Iranian individuals, 5 percent.

The first of two units at Iran's first pipe mill was completed at Ahwaz during 1967. The owner, Torrance Machine and engineering, Inc. has announced that the second unit is scheduled for completion in early 1968. The first unit has a designed capacity of 20,000 tons per year of 18- to 42-inch pipe. Startup problems, however, prevented production from reaching this capacity. The second unit, planned for completion in 1968 is scheduled to produce 15,000 tons per year of 6- to 16-inch pipe. The plant is being financed by Torrance and the National Iranian Oil Company.

Plans for the construction of an integrated steel mill, to be built under a 1965 Soviet-Iranian agreement of intent, were finalized and approved by both Governments in 1967. The plant, will be 43 kilometers southwest of Isfahan and will have an initial annual capacity to produce between 500,000 and 600,000 tons of steel ingot and 350,000 tons of rolled products. Production is expected to begin in 1971. A second phase of construction will double the capacity. All ancillary equipment and facilities built in the first stage will be able to accommodate the expansion. Iron ore will be obtained from the Chogard deposit 16 kilometers northeast of Bafq in central Iran. Reportedly this deposit has reserves of 55 to 65 million tons of ore averaging from 58 to 62 percent iron occurring as magnetite and nonmagnetic martite. A small percentage of sulfur is present and the phosphorus content is an estimated 0.3 percent. Several other deposits of comparable size and ore content occur in the area.

The only known, large reserves of coking coal in Iran are located about 500 kilometers east of the mill site in the Hodjedk area 50 kilometers northwest of Kerman. Work has begun on a rail line that will connect the coal mines with the steel plant via the Bafq iron ore deposits.

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[3] Engineer and Mining Journal. V. 169, No. 5, May 1968, p. 110.
World Mining. V. 4, No. 1, January 1968, p. 37.

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Lead and Zinc.—Recent exploration, financed and implemented jointly by the Ministry of Economy, the United States Agency for International Development, and in 1966 several private mining companies raised the estimate of known lead-zinc ore reserves at four mines from 5 million tons containing 28 percent combined lead-zinc to 35 million tons containing 4 percent lead and 11 percent zinc. The estimated value of the new reserves, if upgraded to marketable concentrates and based on 80-percent recovery, is $750 million. Government support encouraged mining activity so that lead and zinc ore exports rose from 45,737 tons in 1962 to 149,340 tons in 1965.[4]

MINERAL FUELS

Petroleum.—Crude oil production in 1967 increased 23 percent over that for 1966 owing mainly to additional field development by the Consortium (Iranian Oil Exploration and Producing Company and Iranian Oil Refining Company) which accounted for 95 percent of the 1967 total. The remainder was produced by IPAC (Iran Pan-American Oil Company), SIRIP (Société Irano-Italiènne des Petroles), and NIOC (National Iranian Oil Company).

Consortium.—The Consortium continued to explore for oil in the Agreement Area with geophysical surveys and the drilling of 10 exploration wells totaling 72,695 feet of hole. Two relatively large fields, Cheshmeh Khush and Kilur Karim, and two smaller fields, Par-e Siah and Susangerd, were discovered during the year. In addition, 24 development wells were drilled having a total footage of 178,733. Most of th development work was in the Marun and Bibi Hakimeh fields, which together were responsible for most of the increases in crude oil production during 1967. Agha Jari remained the principal producing field in 1967 with 37 percent of output; Gach Saran remained second with 27 percent, followed by Bibi Hakimeh 9 percent, Ahwaz 7 percent, Marun 6 percent, and 11 other fields 14 percent.

A major achievement during the year was the completion of the huge Cham project whereby Kharg Island became the principal crude oil export port and Bandar Mah Shahr the facility for exporting refined products from Aladan. The former was completed in 1966 and can handle 2 million barrels daily. The latter, completed in December 1967 at a cost of $50 million, permits the export of up to 350,000 barrels daily of products from Abadan refinery. Abadan products, which previously transited the Shatt al Arab in Iraq, are now transported 95 kilometers to Bandar Mah Shahr, through three 12-inch lines designed for lightweight fuels, and a 26-inch, heated line for distillate and residual fuel oils. Storage is provided for 8 million barrels and the port can handle tankers having capacities no greater than 50,000 deadweight tons.

In accordance with a December 1966 agreement, the Consortium reliquished in March 1967 three parcels of the Agreement Area totaling 25,069 square miles (64,929 square kilometers), reducing the area by 25 percent. One parcel is in the northwest part of the Agreement Area near the NIOC Naft-e Shah field, the second in the central part, and the third in the southwest, just north of Bandar Abbas.

At the end of 1966 it was announced that the Consortium had agreed to deliver lightweight crude (Agha Jari grade) to the state-owned NIOC for barter sale to East European countries. The 5-year agreement calls for purchases by NIOC to average 80,000 barrels per day. Deliveries were to start in 1967 and are scheduled to reach 120,000 barrels per day by 1971.

The Abadan refinery underwent minor additions and repair, including the expansion of facilities to increase the use of natural gas as refinery fuel. These and previous installations have served to reduce liquid fuel use from about 6,000 barrels daily in the late 1950's to 51 barrels per day in 1967. The Abadan refinery and the Aruba plant in Netherlands West Indies, each with capacities of 460,000 barrels per day at yearend 1967, were the world's largest. Abadan throughput in 1967 averaged 396,388 barrels per day, second only to Aruba. The Consortium has agreed to build a $50 million natural gas liquefaction plant at Bandar Mah Shahr for NIOC. A pipeline to be built from the Gach Saran field will cross the Agha Jari field.

[4] Iranian calendar year beginning March 21 of the year indicated.

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Table 4.—Iran: Summary of petroleum exports (Consortium)

(Thousand 42-gallon barrels)

Year	Crude oil	Products [1]	Total	Products as percent of total
1963	388,404	r 102,589	r 490,993	r 21
1964	460,273	r 100,531	r 560,804	r 18
1965	508,854	101,660	610,514	17
1966	587,637	102,392	690,029	15
1967 p	739,800	103,800	843,600	12

p Preliminary. r Revised.
[1] Includes international bunkers.

NIOC.—Exploration consisted of geophysical surveying near the Caspian Sea and drilling in the Gorgan, Gilan, and Moghan areas. Soviet technicians, which performed and evaluated seismic work for NIOC in Iranian waters of the Caspian Sea, announced that the area contains the world's largest oil reserves.[5] It was rumored that a French drilling company under contract to NIOC struck commercial reserves in northwestern Iran. Production at Naft-e Shah, the only field NIOC owns and operates independent of private interests, averaged 7,780 barrels per day in 1967, up 3 percent from 1966 production.

The NIOC Tehran refinery was in the final stages of construction at yearend. The plant, which will be able to produce a full range of products other than lubricants, will have major processing units as follows:

	Capacity (barrels per day)
Atmospheric distillation	85,000
Vacuum distillation	40,000
Naphtha hydrotreating	10,500
Reforming	12,500
Hydrocracking	14,400
Thermal cracking	16,000

Feedstock for the plant will be Ahwaz crude (33.2° API) or a mixture (37.1° API) of Ahwaz crude and topped crude from the Masjid Soleyman topping plant. Feedstock will be supplied through the 16/20-inch, 80,000-barrel-per-day Ahwaz-Tehran line, which was completed in 1966 and is temporarily being used for fuel oil transport to Tehran.

As in the past, NIOC is the only distributor and marketer of petroleum products. In 1967 petroleum consumption rose to nearly 48 million barrels, 15 percent more than in 1966. Nearly 70 percent of the products sold were supplied by the Abadan refinery; the remainder were from the Masjid Soleyman, Naft-e Shah, and Kermanshah plant. The latter is scheduled for expansion and rehabilitation. A new 40,000-barrel-per-day refinery is planned for Shiraz.

In response to the availability of royalty oil for barter sale to East European countries, NIOC has concluded contracts with Rumania and Bulgaria. Rumania called for the delivery of an average of 24,000 barrels daily of crude during 1968–70. No oil has been shipped to either country, primarily because closure of the Suez Canal increased tanker costs such that sales have not been economically feasible.

NIOC also participates in offshore Persian Gulf exploration as a 50 percent owner of six companies, two of which have found oil. The Sassan field, found in 1965 by Lavan Petroleum Company (LAPCO), is expected to start production in 1968. Offshore production installations and an 88-mile, 22-inch pipeline from the field to Lavan Island are nearing completion. Production capacity is expected to reach 200,000 barrels per day. In 1967, an exploratory well drilled by LAPCO made another discovery 105 kilometers northwest of Sassan field. Iranian Marine International Oil Company (IMINOCO) has also carried out exploratory drilling in the Persian Gulf and has reportedly struck oil. The four remaining companies that have continued offshore exploration activities are Dashestan Offshore Petroleum Co. (DOPCO), Iranian Offshore Petroleum Co. (IROPCO), Farsi Petroleum Co. (F.P.C.), and Persian Gulf Petroleum Co. (PEGUPCO).

[5] Newsletter. National Iranian Oil Company. March 1967, p. 9.

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At the close of 1966, the Iranian Parliament approved a contract signed between NIOC and Entreprise de Recherches d'Activités Pétrolières (ERAP), a French Government company. It is essentially a service contract, whereby ERAP finances exploration at its own risk in exchange for the right to purchase part of production if oil is found. ERAP will be entitled to purchase 35 to 45 percent of the oil produced for 25 years at cost price plus 2 percent plus the taxes, which will be calculated on the basis of real prices. The contract covers approximately 20,000 square kilometers offshore and 200,000 square kilometers onshore. Reportedly the first well drilled in the offshore areas found oil.

IPAC.—Production averaged 99,499 barrels per day in 1967, 57 percent more than in 1966. Most of the increase reflects the commencement of production from Cyrus field during April 1967. This field, which is 84 kilometers west of Kharg Island in the Persian Gulf, joins Darius as the second IPAC field. Production facilities at Cyrus consist of six producing wells, seven crude transfer lines, a production platform, a moored tanker for storage purposes, and loading facilities for incoming tankers. Production facilities have an inital capacity of 25,000 barrels per day, easily expandable to 50,000 barrels per day.

Exploration which resulted in the discovery of the Esfandiar and Ferdowsi fields in 1966 continued in 1967. Both of these fields are on or near the Persian Gulf median line.

SIRIP.—Output from Bahregansar, the lone producing field of this firm, averaged 20,925 barrels per day in 1967, compared with 23,821 barrels daily in 1966. Production declined because of field reservoir conditions. Noruz field, discovered by SIRIP in 1966, 80 kilometers southwest of Bahregansar, is expected to yield about 50,000 barrels per day when it begins production.

Natural Gas.—Iran is fourth in the world and first in the Middle East in natural gas reserves, estimated at 110 trillion cubic feet.[6] Essentially all natural gas produced is dissolved gas brought to the surface by necessity in solution with the crude oil produced. Although most of the natural gas produced (93 percent in 1967) is flared, vented, or otherwise wasted, the Iranian Government, through NIOC, has taken positive steps to reduce this waste.

Table 5.—Iran: Natural gas production and disposal [1]

(Million cubic feet)

Year	Production	Consumption	Used [2] then flared	Flared
1963	367,115	40,884	68,289	257,942
1964	415,345	42,102	80,383	292,860
1965	509,883	43,423	80,258	368,202
1966	632,456	48,957	77,716	505,783
1967	709,238	51,784	e 89,700	e 567,754

e Estimate based on 10 months data.
[1] Data are for the Consortium and NIOC: In 1967, NIOC production was an estimated 2,826 million cubic feet, of which 30 percent was consumed and 70 percent flared.
[2] Used expansively to drive turbines and then flared.

In 1966 the Government of Iran and the U.S.S.R. concluded a barter agreement calling for the export of Iranian natural gas to the U.S.S.R. Iran will supply gas for 15 years, beginning in 1970 at 230 billion cubic feet annually during the first year and increasing progressively to 380 billion cubic feet in the sixth and following years. The gas will be suppied via a 1,100-kilometer trunk line, 40/42 inches in diameter, and capable of transporting 1.4 million cubic feet of gas per day from the southwest fields. Some of the gas leaving the fields will supply Iranian towns near the trunk line, through 490 kilometers of spur lines. Deliveries to Iranian towns are to reach 220 billion cubic feet annually by 1977. It was agreed that NIOC build the line from the fields to Saveh in central Iran and that the U.S.S.R. build the remaining 615 kilometers of line from Saveh to the frontier at Astara. A consortium of West European banks will lend NIOC $220 million for its portion. The U.S.S.R.

[6] Oil and Gas Journal. V. 65, No. 52, Dec. 25, 1967, p. 118.

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is extending credit equivalent to $286 million to cover the portion they will build and the construction of a steel mill and machinery plant near Isfahan.

It was announced in 1967 that the National Petrochemical Company, a wholly owned NIOC subsidiary, will participate jointly with three foreign chemical companies in separate petrochemical ventures. All three plants will use natural gas as feedstock and together will require an investment of $250 million. When completed, these three projects, together with the completed Shiraz plant, will bring to a total of four the plants in Iran producing chemicals from natural gas.

Kharj Petrochemical Company (50 percent Amoco International) began construction of a petrochemical plant on Kharg Island during July 1967. The plant is scheduled to go on stream in early 1969 and will be capable of producing 180,000 tons of elemental sulfur and 2 million barrels of liquefied petroleum gases per year. The largest of the three plants is being built at Bandar Shahpur by Shahpur Chemical company (50 percent Allied Chemical Corporation). The installation will be capable of producing 500,000 tons of sulfur, 300,000 tons of ammonia, 500,000 tons of sulfuric acid, and 150,000 tons of phosphoric acid. The third project (26 percent B. F. Goodrich Company) will be built at Abadan and will produce 54,000 tons of plastics and other chemicals per year.

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The Mineral Industry of Iraq

By James A. West [1] and John R. Lewis [2]

The economy of Iraq is dominated by petroleum; thus, as 1966–67 was an unsettled period for the domestic petroleum industry, the country experienced a deteriorating financial stability although avoiding a major economic setback. Crude oil pipelines of the Iraq Petroleum Companies group (IPC) transit neighboring Syria and deliver up to 900,000 barrels of Iraqi crude oil daily to Mediterranean export terminals. In December 1966, Syria seized these pipelines, closing off this major export route until March 1967. Again, during June 1967, these lines were closed as a backlash of the Arab-Israeli war. In spite of accelerated shipments by the pipeline during the latter half of 1967, as well as between March and June, and a doubling of the movement of oil through Iraq's Persian Gulf facilities, total annual crude oil production was reduced 11.8 percent below the 1966 level.

Normally, direct oil payments constitute about 80 percent of the ordinary Iraqi Government revenue and export earnings. The denial of export routes, sometimes affecting as much as two-thirds of the national production, resulted in a decrease in direct oil payments to $339.6 million in 1967 from the record $394 million in 1966. The situation was somewhat relieved by sizable advance royalty payments by IPC to the Iraq Government.

On the domestic scene, the petroleum industry operated in an uncertain atmosphere originating in 1961 when the Iraqi Government ordered relinquishment of 99.5 percent of the oil concessions held by the IPC group. By June 1965, an agreement in principle between the Government and the IPC group was announced, but by the end of 1967 this settlement had not been ratified by Iraq's Council of Ministers.

On August 6, 1967, the Iraqi Government promulgated Law 97 allocating expropriated acreage to the reconstituted Iraqi National Oil Company (INOC), a government entity, for exploratory drilling and further development. A new version of INOC was created by Law 123 in September 1967, and protests over the expropriations from the companies involved and by their home nations were denied by the Government. In early October 1967, Iraq's press reported that the INOC had taken over all equipment and installations at the prolific North Rumaila oilfield in southern Iraq and that henceforth the INOC would launch a developmental program. It was apparent that interests not yet operating in Iraq were encouraged by events to seek participation in development of the nation's oil resources. A desire to develop a closely coordinated Arab oil policy so as to become more competitive in world petroleum markets also began to appear.

During 1966 and 1967, exploitation of other minerals was limited to salt, cement, natural bitumen, ceramic and minor construction raw materials. During this period, the Government initiated several actions designed to encourage diversification of Iraq's mineral potential. In May 1966, the Council of Ministers established a Directorate of Minerals and Geological Survey within the Ministry of Oil whose purpose was to carry out nonoil mineral exploration and research. Thereafter, the Ministry of Oil announced existence of deposits of elemental sulfur and phosphate rock in the Mosul areas as well as in other parts of Iraq. A British sulfur company was engaged to serve as a consultant, and foreign firms were invited to submit exploitation proposals. Almost a dozen U.S. firms, plus others from France, Rumania, and Lebanon, expressed interest

[1] Area specialist, Near East-Africa, Division of International Activities.
[2] Petroleum engineer, Division of International Activities.

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in the sulfur. No decision as to which offer would be accepted had been made by year-end 1967. Meanwhile, construction of the Kirkuk sulfur extraction plant went forward.

PRODUCTION

Iraq's crude oil output reached a new high in 1966, averaging 1,384,900 barrels daily. However, intermittent successive pipeline closures in late 1966 and during 1967 resulted in a reduction to a daily average of 1,221,400 barrels. In both years, Iraq ranked eighth among world crude oil producing nations, fourth among the Middle East countries, and accounted for 4 percent of world crude output.

Table 1.—Iraq: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Nonmetals:					
Cement---thousand tons	941	1,092	1,285	1,342	e 1,600
Gypsum e---do	500	500	500	500	500
Salt---do	31	e 27	e 60	e 60	e 60
Mineral fuels: Petroleum:					
Crude---thousand 42-gallon barrels	422,581	461,961	[1] 482,461	[2] 505,428	[3] 445,821
Refinery products:					
Gasoline---do	2,315	2,586	2,703	2,699	e 2,700
Kerosine and jet fuel---do	3,228	3,958	4,049	3,697	e 3,800
Distillate fuel oil---do	3,110	3,943	4,472	5,326	e 5,500
Residual fuel oil---do	6,796	7,732	8,565	5,691	e 6,000
Lubricants and other---do	e 681	618	544	e 550	e 550
Asphalt---do	e 226	180	79	467	e 450
Liquefied petroleum gas---do	34	48	e 60	e 60	e 60
Refinery fuel and loss---do	989	1,595	e 722	NA	e 1,200

e Estimate. NA Not available.
[1] Includes an estimate of 5 million barrels from Government-operated Naft Khaneh and Quayara fields.
[2] Includes 2,641,000 barrels from Government-operated Naft Khaneh and Quayara fields.
[3] Includes an estimate of 2,372,500 barrels from Government-operated Naft Khaneh and Quayara fields.

TRADE

Iraqi trade data are not available for 1966; however, oil and cement are the only significant exports. Information from non-official sources indicates that the value of oil imports decreased in 1967 to $821 million, $44 million below the $865 million recorded in 1966 and about equal to the 1965 value. Cement exports were valued at $6.6 million in 1965 and increased to $8.4 million in 1966.

Virtually all metals and nonmetals are imported. Imports in 1966 were probably about the same as those of 1965, when the major items consisted of almost 200,000 tons of iron and steel, about 2,500 tons of aluminum, and a few hundred tons of copper with lesser quantities of lead, zinc, tin, and other metals. Imports of chemical fertilizers appear to have moved upward to 15,000 tons in 1966 compared with approximately 10,000 tons in 1965. A comparison of mineral trade related to total commodity trade, indicating the heavy role of petroleum in the country's exports, is as follows:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1964	794	840	94.5
1965	829	882	94.0
1966	873	939	93.0
Imports:			
1964	30	413	7.3
1965	37	451	8.2
1966	e 40	493	8.1
Trade balance:			
1964	764	427	XX
1965	792	431	XX
1966	[1] 833	446	XX

e Estimate. XX Not applicable.
[1] Adjusted due to estimate of 1966 imports.

The volume of Iraqi exports of petroleum in 1967 was 424,600,000 barrels compared with 491,700,000 in 1966 and 459,-

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364,000 barrels in 1965. Destinations were probably to Europe 76 percent, Far East 11 percent, Western Hemisphere 7 percent, and Africa 6 percent, although individual destinations were not available.

Imports of petroleum have been mostly lubricants. With recently added lubricant production facilities, it is likely that imports were lower than the 20,000 barrels received in 1965.

COMMODITY REVIEW

METALS

Iraq's mineral economy has no important metallic sector. A proposed iron and steel plant, under study since the early 1960's, has been abandoned as infeasible.

NONMETALS

Cement.—The nationalized cement industry, operating under the General Establishment for Industry, expanded output at its six plants during 1966 to 96 percent of their combined rated capacity of 1,400,000 tons per year. On July 6, it was announced that installed capacity would be expanded by 200,000 tons per year in order to meet a strong export demand for Iraqi cement from the Persian Gulf area. By late 1967, another proposed expansion, involving construction of a new plant in the Basra area, was targeted to push Iraq's cement production to 2 million tons annually. This would continue a steadily upward trend which has seen cement output double between 1963 and 1967. Exports, mainly to Persian Gulf countries, likewise have steadily risen during the period. Iraqi cement is of unusually high quality which makes it much in demand.

Ceramic Materials.—The Ramadi ceramics factory, a project begun in 1965, continued development under an assistance agreement between the Iraqi Government and the U.S.S.R. Japanese engineering consultants were overseeing the work. Designed to use locally available dolomite and other raw materials, the plant will cost around $7 million. It will produce utility and sanitary ware, wall tile and refractory bricks; about 60 percent of its output will be glazed clay pipe. Total output is expected to be about 34,000 tons per year.

Also at Ramadi, a $15.4 million glass factory, employing about 1,200 people, will use indigenous raw materials to produce glass products. Construction began in 1966.

Fertilizer Materials.—A team of Japanese, French, and American contractors began construction in 1966–67 of Iraq's first chemical fertilizer plant near Basra at Abu al-Khusaib. Using natural gas piped to it from the nearby Rumaila oilfields, and sulfur supplied by the new Kirkuk extraction plant, the facility will produce major quantities annually of ammonia, urea, ammonium sulfate and sulfuric acid. It is scheduled for completion during 1969–70. Until then, Iraq continues to import her chemical fertilizer needs in annually increasing quantities.

There are low-grade phosphate ores located in Iraq's western desert near Ramadi, close to the Jordanian border. Although there was some interest exhibited by firms whose main objective was the adjacent sulfur deposits, little positive action can be reported during 1966–67.

Sulfur.—In recent years, Soviet-assisted Iraqi Government exploration has proven up several sulfur deposits which appear to total between 100 million and 250 million exploitable tons. Some deposits are remotely located in the desert while others are found around Mosul and Ramadi. A particularly promising and high-grade sulfur deposit, at Mishraq, appeared the most likely candidate for early development. American technicians favor use of the Frasch (hot water) method of extraction. By the close of 1967, no positive disposition had been made of the offers from several foreign firms.

Meanwhile, construction continued throughout 1966–67 on the Kirkuk sulfur plant where startup of the $27 million facility is expected in 1968. Four hundred persons will be employed. About 100,000 tons of elemental sulfur will be extracted annually from the sour natural gases of the Kirkuk oilfield of northern Iraq. Plant output will go to chemical fertilizers and to pulp and paper fabrication plants near Basra. A proposed synthetic textile industry also is expected to become a big user of the output from the sulfur plant.

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MINERAL FUELS

Petroleum and Natural Gas.—At the close of 1967, Iraq's proved crude oil reserves had begun to reflect the moratorium on exploration and development of several years' standing. Reported [3] reserves had dipped from about 25 billion barrels in 1965 to 23.5 billion barrels, a drop in Iraq's share of world reserves from nearly 7 percent in 1965 to about 5.2 percent by 1967. Crude production only averaged 1,221,400 barrels daily in 1967, a reduction of about 12 percent, due to interruptions in pipeline shipments.

Again in 1966–67, the IPC group continued to produce almost all of Iraq's crude oil. Drastic regional adjustments in production were made in 1967. By yearend 1966, output of the two southern Iraqi fields, Rumaila and Zubair, was expanded rapidly in an effort partially to offset the effect of the pipeline shutdown in reducing output in the northern fields. This situation continued well into 1967. Small quantities of crude were produced by the Government at Naft Khaneh and Guayara for local consumption through government channels. The IPC group exported all oil from Iraq in both 1966 and 1967 In overall operations, IPC employs around 16,7000 persons, 69 percent of whom work in Iraq and the remainder in Syria and Lebanon.

Exploration for new oil was suspended in 1961. However, late in 1967, Iraq effected agreements with France's Entreprise de Recherches et d'Activities Petrolieres (ERAP) which should allow exploration and subsequent development of some 6,700 square miles of assorted virgin acreage in southern Iraq. Three of the blocks are onshore and a fourth is offshore in the Persian Gulf. Also, Iraq and the Soviet Union concluded an agreement in principle that provides for Soviet assistance to drill wells in proved areas of southern Iraq, and to conduct exploration surveys in unproven areas in northern Iraq.

Throughout 1966 and 1967, the Iraqi Government continued to delay ratification of an agreement with the IPC group covering IPC's concession areas. This has stalled IPC's own development program. During 1966–67, laws were passed reactivating, strengthening and expanding the dormant Iraq National Oil Co. (INOC). A nine-man National Oil Experts Committee was formed to act as a permanent government advisory group and to put new life into INOC.

All refineries and internal marketing are run by the Government's oil departments. During 1966–67, certain expansion projects went forward. Enlargement of the Daura refinery from 50,000 barrels daily to 75,000 to 80,000 barrels daily was completed. A lubricant plant at the same location was also under expansion, as was a hydrogen desulfurization plant. A pipeline loop to increase crude delivery to the expanded refinery was completed. Work was in progress on dual natural and liquefied gas pipelines from Kirkuk to Baghdad which would supply natural gas to the capital city and liquefied petroleum gas (LPG) to a bottling plant. In a further effort to keep pace with Iraq's petroleum product needs, a new refinery is scheduled for completion at Basra in southern Iraq in 1970. This facility will have between 24,000 and 30,000 barrels per day capacity. Still another refinery, at or near Mosul, is being planned to be onstream by 1974 or 1975.

Offers by foreign firms to construct a natural gas pipeline from the northern Iraq oilfields to Istanbul in Turkey were under study at the close of 1967.

[3] Oil and Gas Journal. V. 65, No. 52, Dec. 27, 1967, p. 118.

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The Mineral Industry of Israel

By Walter C. Woodmansee [1]

Israel's mineral industry made notable advances during 1967, although the war in June caused temporary production cutbacks and delays in plans. Total value of mineral and metal production is not available, but mines and quarries reportedly accounted for 2.5 percent of a $2 billion total industrial output.[2] The gross national product at current prices was $3.45 billion.[3 4]

In 1966 the Government adopted a framework for economic policy during 1967 and 1968. Aims were to reduce the deficit in balance of payments by restoring a steady, 20 percent annual growth in industrial exports including the minerals and metals sectors, to reduce unit labor costs, and to redirect investment and employment to exporting industries. Several export incentives were adopted.

The June war disrupted plans to restructure the economy, which had suffered a slowdown in 1966, and to correct imbalances resulting from former rapid growth. In June 1967 exports were 30 percent lower than in June 1966, largely due to a decline in shipments of cut and polished diamond.

Ambitious plans were made for the manufacture of chemicals and fertilizers, utilizing the large mineral-supply base in potash and phosphate that exists in Israel. All major chemical companies were merged to form a new parent company.

Other projects still under consideration were a waterway through Israel from Eilat on the Gulf of Aqaba to the Mediterranean and a hydroelectric powerplant bordering the Dead Sea that will use Mediterranean water.[5] The Government approved a major oil pipeline, capacity 140 to 150 million barrels per year, from Eilat to Ashkelon on the Mediterranean.

PRODUCTION

Output data for 1967 were not available for some mineral commodities, but the industry was undoubtedly affected adversely by the June war and its aftermath. Production of copper, cement, potash, phosphate, and crude oil were reduced. Reduction of building industry activity, where new starts fell nearly 50 percent, resulted in a lower demand for cement. Other sectors were affected by reduced labor forces during and following the conflict.

Although mineral output was lower, major sectors of the mineral industry planned or continued expansion programs. A new copper deposit at Timna was planned for development. Major expansion programs continued at Dead Sea Works Ltd. (DSW), where potash, salt, and bromine are produced, and at the Oron phosphate works. Other chemical and fertilizer projects were in progress.

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[1] Physical scientist, Division of International Activities.

[2] U.S. Embassy, Tel Aviv, Israel. Annual Mineral Industry Report—1967. State Department Airgram A-786. Apr. 22, 1968, 8 pp.

[3] U.S. Embassy, Tel Aviv, Israel. State Department Airgram A-711, Mar. 26, 1968, 8 pp.

[4] Where necessary, Israeli pounds (£I) have been converted at the rate of £I8 = $1. The Israeli pound was devalued to £I8.5 = $1 on Nov. 19, 1967.

[5] New Scientist. V. 35, No. 562, Sept. 14, 1967, pp. 542, 544.

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Table. 1—Israel: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Copper, cement, 70 to 80 percent Cu	[1] 10,300	e 9,700	e 10,000	10,349	9,464
Steel, ingots and semimanufactures thousand tons	83	83	84	84	e 84
Nonmetals:					
Bromine:					
Elemental	2,941	e r 4,500	e r 7,600	e r 7,100	6,320
Compounds		NA	e 3,200	e r 3,200	1,853
Cement thousand tons	1,022	1,098	1,260	1,168	805
Clays, all types	27,302	e 30,000	r 39,412	41,272	110,834
Gypsum e thousand tons	104	110	110	r 85	90
Lime e do	100	110	130	75	80
Marble e thousand cubic meters	7	7	7	6	6
Phosphate rock, beneficiated thousand tons	300	240	388	r 650	e 600
Potash salts (KCl), 61 percent K_2O do	e 190	256	481	508	492
Salt do	52	43	55	r 58	57
Silica sand do	e 50	e 40	e 50	32	35
Stone, mainly limestone e thousand cubic meters	2,000	2,000	1,500	1,200	1,200
Mineral fuels:					
Peat thousand tons	12	14	15	20	e 20
Petroleum:					
Crude thousand 42-gallon barrels	1,091	1,440	1,469	r 1,359	956
Gas, natural million cubic feet	366	1,069	2,705	3,562	3,859
Refinery products:					
Gasoline thousand 42-gallon barrels	2,672	2,948	r 3,433	4,055	NA
Kerosine do	1,884	2,333	r 1,729	2,017	NA
Distillate fuel oil do	5,433	5,500	r 7,286	6,685	NA
Residual fuel oil do	7,379	8,700	r 8,028	9,539	NA
Other do	NA	478	r 2,063	2,394	990
Total do	17,368	19,959	r 22,539	24,690	NA

e Estimate. r Revised. NA Not available.
[1] Exports.

TRADE

Gem diamond remained the most valuable mineral trade commodity. During 1966, the latest year for which complete trade data were available, imports of rough diamond were valued at $138.9 million compared with $110.7 million in 1965, and exports of cut and polished diamond were $189.5 million compared with $153.7 million in 1965. Data on transactions of crude oil and petroleum refinery products are incomplete. Other significant export values for mineral commodities in 1966 were as follows (1965 values given parenthetically): Copper, including scrap, $17.4 million ($11.7 million); potash, $12.7 million ($13.6 million); phosphate, $4.4 million ($2.9 million); and iron and steel, including scrap, $3.0 million ($2.6 million).

Following diamond, the major 1966 mineral commodity imports were as follows (1965 values given parenthetically): Crude petroleum, $53.0 million ($45.5 million); iron and steel, $41.8 million ($55.0 million); copper, $11.0 million ($8.9 million); industrial diamond, $7.2 million ($6.8 million); aluminum, $6.1 million ($4.9 million); petroleum refinery products, $5.5 million ($8.1 million); and sulfur, $3.2 million ($1.6 million).

The relation of mineral commodity trade to total trade during 1965–66 was as follows:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	201,173	429,147	46.9
1966	234,080	503,281	46.5
Imports:			
1965	255,204	835,437	30.5
1966	279,282	832,588	33.5
Trade balance:			
1965	−54,031	−406,290	XX
1966	−45,202	−329,307	XX

XX Not applicable.
[1] Includes only those commodities listed in tables 2 and 3 of this chapter.
Source: Statistical Office of the United Nations, New York.

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Table 2.—Israel: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum and alloys, all forms	1,682	1,914	Switzerland 597; Turkey 218; Belgium-Luxembourg 200.
Copper and alloys, all forms	r 17,093	22,537	Spain 6,814; Netherlands 6,481; Japan 2,046.
Iron and steel:			
Slag	r 1,039	-------	
Scrap	1,273	1,071	West Germany 768; Belgium-Luxembourg 217.
Semimanufactures	10,373	11,251	Bulgaria 4,105; Iran 1,741; Turkey 1,261.
Lead and alloys, all forms	399	314	West Germany 171; Belgium-Luxembourg 140.
Tin, scrap, long tons	3	175	West Germany 158.
Zinc and alloys, all forms	385	713	Italy 365; Belgium-Luxembourg 212.
Metallic oxides, lead	20	10	All to Netherlands.
Nonmetals:			
Abrasive materials, grinding stones	31	-------	
Cement, portland and clinker	159,316	177,563	Spain 43,130; Cyprus 30,648; Ghana 26,650.
Clay construction materials, brick	10	-------	
Fertilizer materials:			
Natural: Phosphate rock	308,096	423,496	Turkey 143,097; Italy 82,187; Yugoslavia 71,781; Rumania 54,759.
Manufactured:			
Nitrogenous	-------	1,500	All to Cyprus.
Phosphatic	2,206	1,500	Do.
Potassic	391,472	378,170	Poland 147,150; United Kingdom 53,260; Italy 38,754.
Ammonia	43	52	Greece 32; Argentina 10.
Gem stones, precious and semiprecious:			
Diamond, thousand carats	1,333	1,450	United States 525; Belgium 163; Netherlands 132; Switzerland 131.
Other, value, thousands	$158	$261	NA.
Gypsum	-------	850	All to Sierra Leone.
Lime	574	722	Ivory Coast 427; Guinea 135.
Marble	114	4	NA.
Refractory materials:			
Clays	3,142	3,692	West Germany 1,570; Netherlands 1,456.
Brick	1,083	4,167	Greece 3,303; West Germany 378.
Salt	186	209	Nigeria 138; Malaysia 70.
Soda, caustic	976	249	Greece 207; Turkey 42.
Sulfur	45	-------	
Nonmetallic mineral manufactures, asbestos cement.	12,786	7,356	Nigeria 2,755; West Germany 1,629.
Chemical elements, n.e.s	3,115	2,253	United Kingdom 1,486; Hungary 447.
Mineral fuels:			
Carbon black	3,565	3,031	Yugoslavia 1,336; Hungary 1,111.
Petroleum refinery products:			
Gasoline, thousand 42-gallon barrels	3	2	All to Turkey.
Other, mainly asphalt and bitumen, do	6	4	Cyprus 2; Ethiopia 1.
Total p, do	9	6	

p Preliminary. r Revised. NA Not available.
Principal source: Statistical Office of the United Nations, New York.

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Table 3.—Israel: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys:			
Oxide and hydroxide	389	481	France 449.
Scrap	231	220	France 126; Switzerland 40.
Unwrought	6,008	7,026	Switzerland 1,814; United States 1,741; France 1,200.
Semimanufactures	1,685	2,439	United Kingdom 878; France 366; Switzerland 249.
Cadmium, unwrought	4	4	NA.
Copper and alloys:			
Matte	-------	312	Hungary 209; Belgium-Luxembourg 102.
All metallic forms	8,842	9,044	United Kingdom 2,988; Italy 1,383; Austria 1,021.
Gold, unworked or partly worked. troy ounces	r 20,384	27,135	United Kingdom p 23,277.
Iron and steel:			
Iron ore and concentrate	201	-------	
Scrap	1,804	418	NA.
Slag	-------	2	NA.
Oxide and hydroxide	306	241	West Germany 129; United Kingdom 42.
Iron shot, grit, and powder	337	215	United Kingdom 128; West Germany 31.
Pig iron and ferroalloys	12,669	10,560	United Kingdom 5,614; West Germany 4,136.
Blooms, billets, slabs, etc	109,211	47,654	West Germany 23,718; Hungary 15,252.
Semimanufactures	925,884	240,005	Italy 50,272; West Germany 42,949; United Kingdom 33,886; France 23,464.
Lead and alloys:			
Oxides	694	589	France 513; United Kingdom 54.
All metallic forms	1,858	1,560	United Kingdom 829; United States 258; Netherlands 200.
Magnesium, semimanufactures	r 16	10	United States 6; France 3.
Manganese:			
Ore and concentrate	25	-------	
Oxide	100	80	Japan 40.
Mercury 76-pound flasks	290	348	Italy 174; United States 116.
Nickel and alloys, all forms	91	103	United Kingdom 45; Italy 28.
Platinum, partly worked troy ounces	8,841	4,855	United Kingdom p 643.
Silver, unworked or partly worked. thousand troy ounces	r p 695	r 474	United Kingdom p 300; West Germany p 139.
Tin and alloys:			
Oxide long tons	2	2	NA.
All metallic forms do	r 137	145	United Kingdom 91; Netherlands 31.
Titanium oxide	1,503	1,606	Finland 492; United Kingdom 367; Italy 235.
Zinc and alloys:			
Oxide	602	374	France 177; Netherlands 118.
All metallic forms	4,015	2,962	Belgium-Luxembourg 1,637; Poland 682.
Metalliferous ores, n.e.s	379	667	NA.
Metallic compounds, inorganic, n.e.s	739	854	United Kingdom p 262; Netherlands p 184.
Metals, n.e.s	72	41	Netherlands p 26.
Nonmetals:			
Abrasive materials:			
Corundum, artificial	345	270	France 124; West Germany 113.
Pumice and other natural abrasives	1,678	109	United States 73.
Grinding stones and wheels. value, thousands	$107	$140	United States 41; West Germany 33.
Diamond, industrial, including bort. thousand carats	1,094	1,323	Belgium-Luxembourg 466; Ireland 141; Netherlands 101.
Asbestos	8,459	5,851	Canada 4,132; Republic of South Africa 982.
Barite	432	526	United States 400.
Cement	11,384	12,533	Denmark 11,452.
Chalk	128	145	NA.
Clay, kyanite, and smililar minerals	21,419	15,867	United Kingdom 7,602; Cyprus 2,800; Italy 1,649.
Clay construction materials, brick, tile, etc.	48,586	32,602	Italy 14,413; Japan 10,326.
Cryolite	12	111	Denmark 108.
Diatomite	196	349	United States 271.
Dolomite	35	101	NA.
Feldspar	2,701	1,977	Norway 645; Italy 603; France 430.
Fertilizer materials:			
Nitrogenous	4,138	2,009	Austria p 800; United Kingdom p 745.
Potassic	95	1	NA.
Other	10	14	NA.

See footnotes at end of table.

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Table 3.—Israel: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Flint	181	647	NA.
Fluorspar	930	323	NA.
Gem stones, precious, diamond. thousand carats	r 2,707	3,125	United Kingdom 1,752; United States 426; Belgium-Luxembourg 397; Netherlands 388.
Graphite	42	46	NA.
Gravel and crushed stone	-------	647	Italy 319.
Gypsum	113	175	West Germany 101.
Lime	122	80	NA.
Magnesite	r 2,314	1,299	Austria 1,046.
Marbie and other building stone	467	6	NA.
Meerschaum and amber	-------	137	All from Canada.
Mica, unworked	187	124	United Kingdom 58.
Quartz and quartzite	374	500	Belgium-Luxembourg 360.
Refractory materials, brick	2,379	1,045	Austria 266; United States 235; West Germany 228.
Salt	16	236	NA.
Sand	116	162	NA.
Soda, caustic	660	763	United Kingdom 261; Netherlands 184; Italy 120.
Sulfur in all forms:			
Elemental	48,744	59,477	United States 54,207; Canada 4,943.
Sulfuric acid	4,783	8,895	Sweden 6,078; Netherlands 3,806.
Talc and steatite	1,577	1,430	France 548; Austria 303; Italy 200.
Vermiculite	464	-------	
Nonmetals, n.e.s	9	73	West Germany 56; United States 11.
Acids and compounds, nonmetallic, n.e.s	404	362	West Germany 341.
Mineral fuels:			
Peat	249	743	United Kingdom 664.
Carbon black	1,830	502	United States 247; Netherlands 130.
Coal	2,642	1,378	Switzerland 787; Greece 500.
Coke and semicoke	6,439	6,479	Italy 4,018; West Germany 1,755.
Petroleum:			
Crude thousand 42-gallon barrels and partly refined.	e 17,000	e 19,000	Mainly from Iran.
Refinery products:			
Residual fuel oil do	2,520	1,774	NA.
Lubricants do	r 125	r 61	United Kingdom 9; United States 7.
Wax and jelly do	r 33	28	United Kingdom 14; United States 7.
Other do	4	4	United Kingdom 1; United States 1.
Total do	r 2,682	1,867	
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation.	671	860	United Kingdom 231; United States 229; Netherlands 227.

e Estimate. p Preliminary. r Revised. NA Not available.
Principal source: Statistical Office of the United Nations, New York.

COMMODITY REVIEW

METALS

Copper.—Production at Timna of cement copper, containing 75 percent copper, continued at an approximate annual rate of 10,000 tons. During June about 80 percent of the mine workers were called to the armed forces, and heavy equipment at the mine was requisitioned for military operations. However, skeleton crews produced 93 percent of the planned output for the year. Mine development and maintenance suffered during the emergency.

Reserves have been expanded to 17.5 million tons of assured ore and 5 to 10 million tons of probable ore. The average copper content of ore produced in 1967 was 1.1 percent. Exports during fiscal year 1968 (April 1, 1967 to March 31, 1968) were 9,300 tons, valued at $11 million. Under projected development plans current production costs of $931.40 per ton are expected to be reduced to $800 per ton.

Treatment plant capacity has been doubled, reaching 3,000 tons of ore per day. A sulfuric acid plant was commissioned for which the U.S. Agency for International Development financed the loan. Ore is crushed, ground, and then leached in sulfuric acid. Cement copper is precipitated by introducing scrap iron into the solution.

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Development planning continued on a new ore body near the present operations. The new ore body will be mined by underground methods with entry probably by vertical shaft.

Plans for construction of a refinery for fire-refined copper were cancelled, mainly because of the limited world market. Mine output was considered insufficient for construction of an electrolytic refinery.

Iron and Steel.—A West German consortium comprising Mannesman A.G. and August Thyssen Huette A.G. delivered 70,000 tons of steel sheet, valued at $12 million, for the new Eilat-Ashkelon oil pipeline. The sheets were fabricated into 42-inch tubes in Israel.[6]

Magnesium.—A pilot plant was built at DSW for trial production of magnesia for refractory use.

Manganese.—The Ministry of Development planned a study of low-grade ores on the Sinai Peninsula.

Uranium.—In May representatives of Brazil and Israel signed a protocol involving cooperation in nuclear research for peaceful purposes. The program includes joint efforts in the use of radioisotopes, in groundwater exploration and development, in uranium prospecting techniques, and in the processng of uranium ores.[7]

NONMETALS

Bromine.—Each of the units at DSW has an annual capacity of 4,000 tons of liquid. Dead Sea waters contain 1 percent bromine.

Cement.—Production declined further in 1967, owing in large part to a continued slump in the building industry. Early in the year, accumulated stocks were so great that operations were temporarily suspended at two plants.

Exports increased to 252,000 tons in 1967, about 31 percent of total output. These exports, of which 62 percent was clinker, were valued at $1.9 million.

Chemical and Fertilizer Materials.—Expansion continued in the fertilizer and allied chemical industries. Several major projects, approved in 1966, were underway. Israel Chemicals Ltd., a new Government combine formed in 1967, merged all major chemical and petrochemical plants and the Haifa oil refinery. Total assets were about $300 million. A large research and development program was planned. Major companies included were Chemicals and Phosphates Ltd., the Dead Sea Works, Israel Petrochemicals Enterprises Ltd., Arad Chemicals Ltd., Haifa Refineries Ltd., and Haifa Chemicals Ltd. The combine has appointed representatives to the boards of the subsidiary companies and has begun to form its own staff. Research, marketing, transportation, and cosntruction plans will be unified.

Phosphate.—Output of phosphate rock in the vicinity of Oron by Chemicals and Phosphates Ltd., the only phosphate producer, remained high. Plans have been prepared for development of several other phosphate deposits in the Negev.

Exports increased substantially in 1966. An export rate of 500,000 to 600,000 tons per year was planned. Products include calcinated phosphate of 33 to 35 percent P_2O_5, which comprises about one-thrd of total output, and mechanically beneficiated phosphate of about 30 percent P_2O_5 comprising the other two-thirds. Mining grade is 24 percent P_2O_5. Reserves at the developed deposit are considered sufficient until about 1975 at planned output rates. The new giant calcinator, which has a rated capacity of 200 tons per hour, will produce about 500,000 tons per year, half the anticipated output.

High costs, particularly trucking, have been a major problem. The average sale price for beneficiated phosphate was $8 per ton, nearly half of which was due to transportation costs. A rail line under construction from Oron to Dimona will connect with the Beersheba line to Mediterranean ports. Consideration of a pipeline from Oron to Eilat has been abandoned because of the possibility of phosphatic slurry drying in the line and blocking the flow.

Other phosphate deposits, some considered richer than those at Oron, have been discovered in the Negev. At Ein Yahav a deposit contains 8 million tons at 26 to 28 percent P_2O_5. A U.S. company has negotiated with the Israeli Government for several years on possible joint development of this deposit.

[6] Industries et Travaux d'Outremer, No. 170, January 1968, p. 74.
[7] U.S. Embassy, Tel Aviv, Israel. State Department Airgram A-722, May 12, 1967, 2 pp.

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Projects in advanced planning include a phosphoric acid plant of 22,000-tons annual capacity and a potassium nitrate plant of 100,000-tons capacity at Arad, 60 kilometers north of Oron. Operator would be Haifa Chemicals Ltd. Estimated investment in the plants, which will use Oron phosphate, potash, and ammonia, is $12 million. Another project involves Arad Chemicals Ltd., a new company formed by Madera, a U.S. firm, and the Israeli Government on a 50–50 basis, which will produce phosphoric acid at a rate of 230,000 tons per year for the export market. Investment was estimated at $30 million, with construction to start in 1968.

Potash.—Exports of potassium chloride (KCL) were reduced in 1966 as a result of a slump during the first half of the year, when shipments were 35 percent lower than during the corresponding period in 1965. Large stocks accumulated in warehouses. In 1967 marketing was disrupted by the June war, increased foreign competition, and lower world prices. Planning involved a price of $28 to $30 per ton, but world prices fell to $24 per ton. A 5-year contract was concluded with Poland for delivery of 200,000 tons of potash annually.

Expansion continued at DSW, Sedom, at the southern end of the Dead Sea. Early in 1967 a first-stage expansion was completed, raising capacity to 600,000 tons per year. The second stage, underway at yearend, was planned to raise annual capacity to 1.2 million tons in 1970. The first stage included a 400,000-ton potash refinery and ore-working line. The product contains 97.5 percent KCL, produced by flash evaporation. Capacity also exists for 200,000 tons KCL per year by flotation. The number of dredges for gathering precipitated carnallite from the evaporation pans will be increased to 13.

In 1966 DSW applied for a $16 million loan through the International Bank for Reconstruction and Development to finance plant construction. Negotiations were delayed by difficulties in dike construction for additional evaporation pans, when Kaiser Engineering, Inc., discontinued work on the outer dike because of a dispute over construction specifications. The dike project apparently was nearing completion at yearend 1967.

According to the local press, DSW profits have been reduced considerably because of steadily rising production, marketing, administrative, and financing costs. The Government, following an inquiry by a committee under the Deputy Minister of Development, agreed to subscribe $8.5 million, about two-thirds of new share capital necessary to finance expansion.

The DSW secretary confirmed that the proposal for a pipeline for potash slurry from Sedom to Ashdod on the Mediterranean coast was approved and that planning was in the final stages. The project was coordinated with the Arad chemical project, which would use the potash solution and in which DSW holds a substantial interest. The pipeline was expected to reduce by one-half the transportation costs to export markets and also permit the export of salt and magnesium chloride. Present haulage of potash from Sedom to Eilat and Ashdod ports is by 40-ton, double trailer trucks.

Clays.—Operations of Negev Chemical Materials Ltd. were closed down temporarily. The company reported a loss of $2.6 million during fiscal year 1967–68, owing to inconsistent quality of product and to availability of lower priced substitutes.

Diamond.—The value of sales of polished diamond increased in 1966, reaching $189.5 million, 23 percent over that of 1965, although the increase by volume was only 10 percent. Sales to the United States remained strong. The London syndicate raised the price for crude diamond substantially, causing a sharp rise in price for the polished gem stone. The syndicate supplied Israel with rough diamond valued at $64.6 million in 1965 and $73.7 million in 1966. Gross and net trade in the latter year were as follows:[8]

	Gross	Returned	Net
Imports:			
Thousand carats	3,125	405	2,720
Value, million	$139	$14	$125
Exports:			
Thousand carats	1,450	168	1,282
Value, million	$190	$25	$165

Technion, The Israel Institute of Technology, Haifa, reported the development of a new method for determining

[8] Israel Industry and Commerce. V. 18, No. 3–4, April 1967, pp. 18–20.

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the proper direction for polishing by use of a dynamometer made in its laboratory. This new method was claimed to be faster and more accurate than existing industrial methods.

MINERAL FUELS

Petroleum and Natural Gas.—*Production.*—The decrease in crude oil output was attributed to a decline in the yield of wells in the Heletz field. Heletz No. 35, a successful development well drilled in 1967, was deepened to seek further oil-bearing horizons. Lapidot Israel Oil Prospectors Ltd., operator of the field, reduced spacing of development wells from 80 to 40 acres per well. At yearend 32 wells were productive. According to the Ministry of Development, total crude oil reserves were estimated at 20 to 25 million barrels.

Late in the year, Israel reportedly pumped oil at the El Belayim field in the Gulf of Suez, offshore from Sinai. The oil was shipped to Eilat, where it entered the 16-inch pipeline to the Haifa refinery.

Throughput at the Haifa refinery was estimated at 29 million barrels in 1966 and 32 million barrels in 1967. Theoretical maximum refinery throughput capacity is about 40 million barrels per year. Plans for a small refinery at Eilat were abandoned early in the year because of the adverse effect such a facility would have on a planned tourist center there.

Exploration and Development.—Legislation, introduced in 1966 to provide incentives for exploration, gave marketing preferences, up to total domestic requirements, to any company finding oil in Israel. The Government also announced willingness to contribute up to 50 percent of the costs of exploration wells. A countrywide magnetic survey conducted early in the year was financed by the Government, and the results were distributed free of charge to all exploration companies in the country.

No new oil or gas discoveries were made during the year. Sixteen exploration and development wells were drilled, of which three were underway at yearend. Two development wells were successful in the Heletz field, and one gas well was successful in the Har-Kidod field.[9] At yearend there were nine productive gas wells. Estimated natural gas reserves at the beginning of 1967 were 50 billion cubic feet.

At midyear Israel was divided into five exploration districts—the East and West Negev, two North areas, and the offshore.[10] The East Negev was offered to Lapidot Israel Oil Prospectors, the West Negev was offered to Naphtha Israel Petroleum, the two northern areas were offered to foreign companies, and the offshore areas were offered to Belco Petroleum, an independent U.S. company.

Naphtha Israel, operator of the Har-Kidod and Har-Hakanain gasfields near Arad, started a well at Har-Menahem, between the two fields. Lapidot Israel was drilling an exploratory well at Rosh Pinah, Galilee, and conducted seismic work in the Ashkelon area. Belco was granted the offshore license formerly held by Petrocana Corp. but canceled by the Government for failure to perform offshore drilling on schedule. Belco agreed to start two deep wells during the year. Mayflower Oil Exploration Co., Okla., was granted a license to a 100,000-acre tract in the Ziglag region, north of Beefsheba. Two domestic companies, Israel National Petroleum Ltd. and Paz Oil Ltd., each participated to the extent of 25 percent.[11]

The Government announced authorization for the proposed 260-kilometer, 42-inch pipeline from Eilat to Ashkelon. First-phase construction was to start in 1968, with scheduled completion in 1969. Initial annual capacity will be 20 million tons (about 147 million barrels); second-phase plans are for a capacity of 60 million tons (440 million barrels). The first phase, largely financed by the Government, will cost about $60 million, including $30 million for pipeline construction, $21 million for storage tanks, $6 million for port facilities, including offshore berths for 500,000-ton tankers, and $3 million for additional pumping stations. The operator, Tri-Continental Pipelines Ltd., has a 49-year concession for the existing Eilat-Haifa 16-inch line.

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[9] Petroleum Press Service, V. 35, No. 2, February 1968, p. 73.
[10] Petroleum Press Service, V. 34, No. 6, June 1967, p. 233.
[11] Petroleum Press Service, V. 34, No. 10, October 1967, p. 394.

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The Mineral Industry of Italy

By F. L. Klinger [1]

In 1967, Italy's mineral industry reported gains in output and in new productive facilities despite a number of problems including a construction slump, cost increases resulting from floods late in 1966 and a series of new labor contracts, difficulties arising from rationalization of the sulfur and lead-zinc industries, and reductions in protective tariffs.

In Government actions, an offshore oil and gas law was passed in July which permitted exploration of continental shelf areas. Negotiations for foreign supplies of gas continued, particularly with the Soviet Union, and there was also increased participation by regional governments in mineral developments, especially in Friuli-Venezia Giulia and Sicily.

Fuel consumption continued to increase with large investments planned for conventional and nuclear powerplants, and Italy continued to lead West Europe in petroleum refinery capacity.

PRODUCTION

The general index of production for the extractive industry in 1967 increased by 6.2 percent compared with 1966. In metal mining, declines in iron and mercury output were offset by gains in lead and zinc. In nonmetals, increased output of asbestos, clay, pyrite, salt, and marble more than made up for reduced production of barite, bentonite, potash, and sulfur. In fuels, noteworthy increases in lignite and natural gas output compensated for declines in crude petroleum and coal extraction. The total value of 1967 crude mineral output was estimated at approximately $500 million.

In the mineral processing industries, which rely to a large extent on imported raw materials, there were substantial increases in most production sectors as shown by the following indices:

Mineral processing industry sector:	Index (1966 = 100)
Ferrous metals	117.6
Nonferrous metals	103.2
Nonmetallic mineral manufactures	113.8
Inorganic chemicals	107.9
Chemical fertilizers	105.3
Petroleum refinery products	107.0
Coking-plant products	99.4

[1] Physical scientist, Division of International Activities.

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Table 1.—Italy: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Aluminum:					
Bauxite	268,609	251,791	244,431	r 242,163	242,027
Alumina, Al_2O_3 content	238,699	262,637	278,139	270,745	285,506
Metal:					
Primary	91,428	115,595	123,976	127,645	127,778
Secondary	65,000	58,000	61,000	85,000	102,000
Semimanufactures	107,000	105,000	112,000	144,000	151,000
Superpure	NA	338	352	327	NA
Antimony:					
Ore, 13 to 57 percent antimony	r 500	r 930	854	765	1,243
Regulus	405	383	280	348	403
Oxide	113	74	57	77	81
Sulfide	20	44	45	61	91
Cadmium	282	r 277	r 296	245	218
Copper:					
Concentrate, 21 to 23 percent copper	4,531	3,531	r 3,332	4,867	7,393
Cement, copper content	3,300	3,200	2,800	2,600	2,791
Refined, secondary	13,000	11,700	12,700	16,900	17,500
Alloy ingots (from custom smelters):					
Brass	17,000	19,000	16,500	24,000	26,000
Bronze	10,500	12,000	10,500	11,000	12,500
Other	2,000	1,700	2,300	3,000	3,800
Semimanufactures:					
Copper	178,000	173,000	173,300	185,900	200,000
Brass	139,700	115,000	123,400	133,500	148,900
Other (including cupro-nickel)	5,300	5,000	5,800	6,600	6,100
Iron and steel:					
Iron ore—thousand tons	1,024	876	785	784	737
Roasted pyrite [1]—do	e 864	e 823	e 839	e 925	e 740
Sinter and other agglomerates—do	2,538	2,608	5,407	r 7,136	e 8,300
Pig iron—do	3,741	3,498	5,490	6,259	7,294
Ferroalloys—do	127	127	139	158	170
Steel ingots and castings—do	10,157	9,793	12,681	13,639	15,890
Semimanufactures:					
Hot rolled:					
Wire rod—do	563	553	674	646	771
Other bars and rods [2]—do	2,848	2,660	2,919	3,343	4,018
Sections—do	634	644	725	316	452
Plates and sheets—do	859	829	952	1,032	1,349
Coils—do	1,637	1,650	3,041	3,517	4,033
Strip—do	429	468	550	551	611
Seamless tube—do	817	724	784	798	852
Other—do	194	214	224	200	148
Total hot rolled—do	7,981	7,742	9,869	10,403	12,234
Castings and forgings—do	228	200	208	229	298
Cold rolled sheet—do	1,664	1,858	2,216	2,467	2,685
Lead:					
Concentrates (including silver-bearing)	r 51,117	r 50,914	54,821	57,979	60,898
Oxides	17,332	14,680	11,621	15,800	NA
Metal:					
Primary, unalloyed	41,937	37,913	r 45,420	53,555	60,498
Secondary, unalloyed	5,700	6,500	7,900	10,800	11,800
Semimanufactures	38,500	39,500	39,000	46,000	48,500
Magnesium	5,527	6,028	6,313	6,515	6,347
Manganese ore	45,257	47,803	47,810	r 43,984	47,098
Mercury:					
Ore	r 256,941	r 275,327	r 322,218	r 307,005	298,698
Metal—76-pound flasks	54,448	57,001	57,320	53,549	48,066
Nickel semimanufactures, including anodes	300	350	220	270	350
Silicon	17,000	17,750	19,750	r 18,728	19,044
Silver—thousand troy ounces	1,006	1,074	1,103	1,132	1,382
Tin:					
Alloys:					
Solder—long tons	4,035	3,543	3,448	3,838	3,937
Babbitt—do	1,083	738	492	708	984
Semimanufactures [3]—do	NA	118	103	98	98
Titanium dioxide	31,681	38,894	40,090	39,499	NA
Tungsten concentrates (65 percent WO_3)	2	1	1	1	1
Zinc:					
Rich concentrate (about 52 percent zinc)	r 204,879	r 213,057	224,485	r 213,391	218,569
Lean concentrate (14 to 24 percent zinc)	8,615	r 16,782	----------	13,287	41,551
Oxide	13,373	12,273	12,322	12,563	NA

See footnotes at end of table.

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Table 1.—Italy: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals—Continued					
Zinc—Continued					
Metal:					
Primary	73,565	73,013	80,898	77,229	89,026
Secondary, from scrap and residues	4,900	600	---	---	---
Alloys	16,600	16,200	18,400	21,300	23,500
Semimanufactures	10,400	8,700	9,500	10,500	10,300
Nonmetals:					
Asbestos	57,167	68,559	71,862	82,068	100,740
Barite:					
Crude	103,627	104,745	141,895	172,738	154,066
Ground	47,249	56,173	NA	NA	NA
Boric acid, from steam	514	319	86	---	---
Bromine, elemental	1,162	1,605	2,059	1,977	NA
Celestite	654	457	640	598	660
Cement—thousand tons	22,088	22,840	20,695	22,374	26,272
Cement rock—do	4,459	r 4,814	3,800	3,971	3,981
Clays:					
Bentonite—do	160	r 131	r 152	r 202	NA
Bleaching—do	132	205	r 170	88	93
Kaolin, crude—do	88	97	r 108	69	88
Kaolinitic earth—do	r 113	94	r 49	r 35	NA
Refractory—do	194	r 250	220	254	NA
Other:					
For bricks and terra cotta—do	26,660	24,060	18,867	NA	NA
For cement—do	3,219	3,195	2,900	NA	NA
Diatomite	59,429	69,350	63,266	62,715	e 65,000
Dolomite:					
For magnesium manufacture	r 76,070	81,509	69,573	65,604	NA
For refractory and other uses	785,219	834,483	913,136	NA	NA
Earths:					
For pigment	5,520	4,990	680	NA	NA
For foundry use	230,051	216,338	417,716	NA	NA
Feldspar:					
Crude	102,099	111,614	r 96,999	138,102	147,462
Ground	96,095	94,751	85,397	NA	NA
Fertilizer materials:					
Crude:					
Potassium salts—thousand tons	1,264	1,470	r 1,723	r 1,859	1,813
Manufactured:					
Nitrogenous—do	2,788	2,687	3,087	3,183	3,435
Phosphatic:					
Basic slag—do	112	88	18	---	---
Superphosphate (mineral)—do	1,476	1,279	r 1,390	r 1,671	1,575
Potassic—do	256	318	352	376	324
Other (compound)—do	1,554	1,778	1,638	1,800	1,942
Fluorspar	134,633	124,694	r 153,333	r 195,220	205,196
Graphite	1,862	1,691	1,227	1,070	1,877
Gypsum, industrial—thousand tons	r 2,305	r 2,441	r 3,080	r 3,180	NA
Iodine, crude—kilograms	3,270	---	---	NA	NA
Lime e—thousand tons	5,700	5,100	4,300	5,100	NA
Limestone (excluding dimension stone)—do	64,415	57,548	53,805	NA	NA
Magnesite	6,815	6,309	3,536	2,601	4,492
Pozzolan—thousand tons	4,323	4,067	3,869	r 3,808	e 3,800
Pumice—do	656	616	r 537	e 960	NA
Pumiceous lapilli—do	280	347	r 280		
Pyrite, including cupriferous pyrite—do	1,402	1,395	1,402	1,304	1,411
Quartz (ground)	57,454	33,971	NA	NA	NA
Salt:					
Marine (crude)—thousand tons	903	818	NA	NA	NA
Other (including Solvay brine) do	1,892	2,031	2,129	2,117	2,577
Stone, sand and gravel, n.e.s.:					
Dimension stone:					
Calcareous, including travertine:					
Alabaster, including onyx	r 6,824	22,843	6,522	NA	NA
Gypsum, other than alabaster	84,140	85,615	88,050	e 90,000	NA
Limestone	r 705,841	483,903	437,324	486,983	NA
Marble, in blocks:					
White	653,864	646,441	634,885	697,877	NA
Colored	840,217	764,753	831,991	886,967	NA
Schist	30,852	30,672	25,469	NA	NA
Travertine	403,651	393,166	386,174	387,949	NA
Tufa—thousand tons	1,388	1,240	917	794	NA

See footnotes at end of table.

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Table 1.—Italy. Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Nonmetals—Continued					
Stone, sand and gravel, n.e.s.—Continued					
Dimension stone—Continued					
Other:					
Gneiss	110,273	91,297	80,540	NA	NA
Granite	r 63,002	68,262	57,097	NA	NA
Lava (basalt and trachyte)	r 949,330	610,271	343,177	301,218	NA
Porphyry	156,390	169,116	145,169	NA	NA
Sandstone and quartzite	r 246,024	119,608	118,144	NA	NA
Serpentine	r 110,558	102,346	139,231	NA	NA
Slate	60,870	56,755	58,773	NA	NA
Volcanic tuff	548,056	702,165	657,349	NA	NA
Other	40,153	49,422	35,953	NA	NA
Total	r 6,398,045	5,636,635	4,962,848	NA	NA
Crushed and broken stone [4] thousand tons	r 27,050	22,469	24,100	NA	NA
Sand:					
Volcanic	115,000	237,000	180,000	NA	NA
Silica sand thousand tons	r 2,791	3,105	3,267	3,277	NA
Sand and gravel do	37,060	37,640	33,505	NA	NA
Sulfur:					
Ore do	984	678	r 649	r 584	488
Concentrate (90 percent sulfur)	95,000	67,041	59,252	79,538	73,492
Crude (in briquets—excluding by-product)	41,788	28,929	36,226	14,056	9,836
Talc and steatite	139,335	133,830	r 121,455	112,679	118,467
Mineral fuels:					
Asphaltic and bituminous rocks:					
For distillation	271,743	238,239	r 208,509	r 238,284	236,162
For paving	114,823	108,046	r 59,859	54,024	70,774
Carbon black	43,700	64,300	73,900	83,665	90,605
Coal:					
Anthracite	14,021	r 9,486	5,592	85	--
Subbituminous (Sulcis coal)	572,040	r 461,985	r 383,444	417,802	410,408
Coke:					
Metallurgical thousand tons	4,595	4,683	5,737	r 6,267	6,246
Gasworks do	725	542	386	r 340	317
Lignite do	1,366	1,203	r 1,011	1,066	2,201
Natural gas, million normal cubic meters	7,268	7,684	7,802	r 8,825	9,367
Natural gasoline (condensate)	55,065	63,123	68,024	92,201	106,819
Petroleum:					
Crude thousand tons	1,784	2,669	2,210	1,757	1,616
Refinery products:					
Gasoline thousand tons	6,519	7,407	8,543	r 10,185	11,693
Jet fuel do	706	793	1,006	r 1,435	1,269
Kerosine do	812	829	1,334	r 1,490	2,206
Distillate fuel oil [5] do	12,616	15,536	18,910	r 56,547	59,105
Residual fuel oil [6] do	21,561	25,384	30,078		
Bitumen do	1,055	1,226	1,228	r 1,299	1,483
Petrochemical feedstocks do	797	1,106	1,702	1,690	2,257
LPG do	963	1,087	1,272	1,474	1,605
Lubricants do	169	259	347	r 443	446
Other do	312	505	800	r 1,292	1,109
Total refinery products do	45,510	54,132	65,220	r 75,855	81,173
Refinery fuel and loss do	3,008	3,714	4,152	r 4,760	5,173
Crude oil processed do	48,518	57,846	69,372	r 80,615	86,346

e Estimate. r Revised. NA Not available.

[1] Net exports plus consumption in agglomerating plants and blast furnaces in iron and steel industry. Excludes pellets.

[2] Includes rerolled scrap.

[3] Includes alloys except solder.

[4] Excluding limestone and gypsum.

[5] Includes gas oil, and fuel oils less than 5° E ("fluidissimo" and "fluido").

[6] Includes fuel oils greater than 5° E ("semi-fluido" and "denso").

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TRADE

Preliminary data indicated that in 1967 mineral commodities increased their share in the total value of Italy's trade, with the value of exports increasing about 10 percent and the value of imports increasing more than 20 percent as compared with 1966. The increase in the trade deficit attributable to mineral commodities appeared to be greater than the increase in deficit for all commodity trade. Large increases in imports of crude oil and of iron and steel, which together accounted for 60 percent of the value of mineral commodity imports and 20 percent of all commodity imports in 1967, were mainly responsible. A gain of about $100 million in exports of mineral commodities resulted from increased shipments of petroleum products, building stone, and iron and steel. In value, Kuwait continued to be the leading source of Italian mineral commodity imports and West Germany was the foremost recipient of exports.

Relationships between mineral commodity trade and total trade in 1965 and 1966, and the principal items constituting Italy's mineral commodity trade, are shown in the following tabulations:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Export:			
1965	1,150	7,188	16.0
1966	1,192	8,032	14.8
Import:			
1965	r2,260	7,347	30.8
1966	2,632	8,571	30.7
Trade balance:			
1965	r−1,110	−159	XX
1966	−1,440	−539	XX

r Revised. XX Not applicable.

Source: Statistical Office of the United Nations. 1967 data.

	Value, million dollars	
	1965	1966
Exports:		
Iron and steel [1]	367.0	340.2
Copper	63.2	45.1
Aluminum [1]	35.3	34.5
Mercury	19.0	18.7
Fertilizer [1]	82.3	76.7
Building stone	63.7	72.3
Petroleum products	388.8	466.1
Other	130.7	138.4
Total	1,150.0	1,192.0
Imports:		
Iron ore	r75.4	80.0
Iron and steel [1]	499.3	566.0
Copper [1]	191.2	285.1
Aluminum [1]	[3]48.0	[3]81.5
Fertilizer [2]	34.5	42.5
Coal, coke, lignite	163.0	161.4
Petroleum, crude	930.5	1,034.4
Petroleum products	62.2	74.1
Other	255.9	307.0
Total	2,260.0	2,632.0

[1] Including scrap.
[2] Including manufactured fertilizer.
[3] Including bauxite and alumina.

Table 2.—Italy: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Bauxite	3,247	1,615	Switzerland 1,430.
Oxide and hydroxide	11,606	9,663	Austria 6,389; Switzerland 2,291.
Metal and alloys:			
Scrap	37	231	West Germany.
Unwrought	32,042	20,643	Argentina 8,850; France 4,756; West Germany 2,941.
Semimanufactures	23,010	27,068	United States 11,606; West Germany 2,354.
Antimony	1	2	NA.
Beryllium oxide—kilograms	500	NA	NA.
Bismuth, including manufactures	(1)	(1)	NA.
Cadmium	12	135	Netherlands 80; West Germany 15.
Chromium:			
Ore and concentrate	-------	14	NA.
Oxide and hydroxide	336	211	United States 100; Mexico 43.
Cobalt:			
Oxide and hydroxide	-------	(1)	NA.
Metal	1	1	NA.

See footnotes at end of table.

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Table 2.—Italy: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Copper:			
Ore and concentrate	1,015	2,404	Sweden 1,744; Austria 660.
Matte	80	188	Switzerland 167.
Metal and alloys:			
Scrap	472	330	West Germany 151; Austria 62.
Blister copper	527	591	Japan 303; Netherlands 106.
Refined	16,523	5,089	West Germany 1,367; France 1,167; Netherlands 782.
Master alloy	79	170	Austria 60; Belgium-Luxembourg 55.
Semimanufactures	39,180	23,944	West Germany 3,606; Netherlands 2,768.
Germanium—value, thousands	$198	$113	NA.
Gold, semimanufactures—troy ounces	1,350	6,430	NA.
Iron and steel:			
Iron ore—thousand tons	37	19	France 18.
Roasted pyrite—do	642	752	Austria 336; West Germany 179; United Kingdom 129.
Scrap—do	2	2	West Germany 1.
Pig iron [3]—do	3	4	Common Market 2.
Ferroalloys—do	16	20	West Germany 9; United States 3; United Kingdom 2.
Steel: Ingots and other primary forms—do	113	158	Spain 30; United States 27; Israel 27; France 25.
Semimanufactures:			
Bars, rods, and sections—do	1,013	661	West Germany 233; France 83; Bulgaria 50.
Universals, plates and sheets—do	652	717	France 122; China, mainland 121; West Germany 92.
Hoop and strip—do	57	70	Pakistan 19; Greece 11; West Germany 9.
Rails and accessories—do	24	18	Switzerland 8; Turkey 5.
Wire, excluding wire rod—do	21	15	Common Market 6; Yugoslavia 3.
Tubular products—do	553	456	United States 45; Iran 42; Trucial States 32.
Castings, rough—do	5	8	Switzerland 2; France 1.
Total semimanufactures—do	2,325	1,945	
Lead:			
Ore and concentrate	4,662	2,906	Austria 2,530; France 352.
Oxides	1,570	1,703	Hungary 1,605.
Metal and alloys:			
Unwrought	159	103	West Germany 76.
Semimanufactures	79	155	France 66; Libya 27.
Magnesium and alloys:			
Scrap	-------	70	France 68.
Unwrought	5,919	4,631	West Germany 2,471; Austria 445; France 364.
Semimanufactures	10	14	West Germany 6.
Manganese			
Ore	1,052	557	West Germany 446.
Metal	6	1	NA.
Mercury—76-pound flasks	51,112	45,427	United States, 16,564; United Kingdom 9.892 West Germany 5,570.
Molybdenum	3	-------	
Nickel and alloys:			
Matte	-------	10	All to United Kingdom.
Unwrought, including scrap	178	94	Netherlands 31; United States 16; West Germany 14.
Semimanufactures	1,090	1,037	Morocco 198; Bulgaria 157; Iran 139.
Selenium—kilograms	NA	4,821	West Germany 1,607; Czechoslovakia 1,351.
Silicon	12,187	10,505	West Germany 3,206; United Kingdom 3,036.
Silver and platinum-group metals:			
Ores and residues—kilograms	19	11,300	All to United Kingdom.
Platinum [3]—thousand troy ounces	50	38	West Germany 30; France 3; Switzerland 2.
Silver—do	288	363	Belgium-Luxembourg 164.
Tantalum—value thousands	$41	$2	NA.
Tin and alloys, all forms—long tons	191	264	Denmark 116; United Kingdom 39; Yugoslavia 31.
Titanium:			
Dioxide	17,597	19,222	Poland 2,531; France 1,606; United Kingdom 1,606.
Metal, including scrap	1	9	NA.
Tungsten	27	13	West Germany 4.

See footnotes at end of table.

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Table 2.—Italy: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Zinc:			
Ore and concentrate	30,424	41,153	Austria 12,650; France 11,356; Poland 7,360.
Oxides	389	1,100	Yugoslavia 470; West Germany 140.
Metal and Alloys:			
Unwrought	1,423	61	NA.
Semimanufactures	150	328	France 150; Switzerland 67.
Miscellaneous, n.e.s:			
Nonferrous ores, including ashes and residues.	12,866	16,524	West Germany 9,124; Belgium-Luxembourg 2,451.
Base metals	10	5	NA.
Metallic oxides and hydroxides, n.e.s.	75	434	France 131; Sudan 77.
Metalloids, n.e.s.	176	330	United Kingdom 186; West Germany 80.
Oxides, hydroxides of barium, strontium, magnesium.	9,341	23,981	United Kingdom 15,180; Netherlands 5,033; Republic of South Africa 2,906.
Nonmetals:			
Abrasives, n.e.s.:			
Grinding stones	2,239	2,820	France 765; United Kingdom 786; West Germany 274.
Pumice	148,695	319,445	United States 135,354; Netherlands 70,487.
Corundum, garnet, tripoli and other	1,556	1,062	Sweden 220; United States 198.
Asbestos	25,699	35,937	West Germany 13,671; France 8,022.
Barite, including witherite	32,993	17,905	Netherlands 13,919; Libya 1,150.
Cement	567,224	465,484	Spain 186,492; Libya 132,406; Nigeria 24,410.
Chalk	455	545	NA.
Clays and clay construction materials:			
Bentonite	21,316	29,332	France 6,643; Libya 5,217; Nigeria 4,600.
Kaolin	549	396	Switzerland 202; Greece 104.
Other, including andalusite, etc.	3,023	14,085	France 10,286; Austria 1,282.
Construction materials:			
Refractory	17,724	26,647	Switzerland 3,745; Spain 2,723; West Germany 2,159.
Nonrefractory	337,762	414,383	Switzerland 87,248; France 80,575; Libya 76,655; West Germany 66,368.
Cryolite	36	-------	
Diamond:			
Gem—value, thousands	r $59	$70	United Kingdom $51.
Diatomite	634	1,527	France 1,116 West Germany 131; Iran 91.
Dolomite, including calcined	13,992	15,310	Switzerland 7,708; Austria 2,015; Ghana 1,087.
Feldspar	23,194	23,586	West Germany 15,086; Austria 1,971; Switzerland 1,930.
Fertilizer materials:			
Crude:			
Potassium salts	13,444	-------	
Manufactured:			
Nitrogenous—thousand tons	1,161	1,013	China, mainland 303; United Arab Republic 194; Turkey 108; Yugoslavia 102.
Phosphatic—do	2	2	Mainly to Libya.
Potassic—do	135	152	Poland 41; United States 12; Japan 12; Netherlands 12.
Compound—do	313	367	Yugoslavia 55; India 42; Cuba 40; Turkey 32.
Ammonia, anhydrous	13,664	6,311	Greece 4,895.
Fluorspar	52,464	55,276	United States 46,976; West Germany 2,528.
Graphite	1,680	1,421	France 1,064.
Gypsum and plasters	18,368	17,389	Switzerland 10,983; Austria 1,558.
Lime	37,038	55,290	Libya 40,824; Switzerland 13,222.
Limestone (industrial)	869	1,120	Switzerland 1,020.
Magnesite	92	265	Switzerland 111; West Germany 49.
Mica:			
Crude	166	582	Kuwait 283; Iran 75; United Arab Republic 60.
Worked	32	35	Yugoslavia 25.
Pigments, mineral, including iron oxide and hydroxide.	1,142	1,530	United States 585; Sudan 172; France 131.
Precious and semi-precious stones (including synthetic), except diamond.	value, thousands $326	$343	Switzerland $113; West Germany $56.
Pyrite, unroasted	52,569	52,301	Switzerland 47,227; Austria 4,709.
Quartz and quartzite	20,743	26,780	Switzerland 12,404; France 10,995.
Salt	56,787	18,699	Norway 5,250; Iceland 3,190; Greece 2,500.
Other sodium and potassium compounds:			
Caustic soda	218,127	182,767	U.S.S.R. 59,840; Greece 23,430; Brazil 24,372.
Caustic potash	2,016	2,451	China, mainland 1,501; Netherlands 165.

See footnotes at end of table.

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Table 2.—Italy: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals—Continued			
Stone, sand and gravel:			
Dimension stone:			
Unworked:			
Granite, porphyry, etc	33,836	32,707	Switzerland 12,784; Austria 8,025; West Germany 6,368.
Marble and other calcareous.	269,789	266,630	West Germany 56,412; France 40,400; United States 23,013.
Slate	5,117	7,339	France 3,127; West Germany 1,747.
Worked:			
Slate	21,869	22,772	West Germany 8,445; France 5,703; United States 5,680.
Other	195,421	276,640	West Germany 123,203; France 84,750; United States 31,930.
Gravel and crushed stone	390,177	392,818	West Germany 109,957; Switzerland 54,556.
Sand	157,768	182,415	Switzerland 163,764; France 8,923.
Strontium minerals	100	119	All to Norway.
Sulfur, including purified sulfur	2,473	1,780	Thailand 850; Czechoslovakia 159.
Talc and steatite	43,013	39,450	United States 9,125; United Kingdom 6,881; West Germany 6,440.
Miscellaneous:			
Mineral substances, n.e.s	80,372	95,664	United Kingdom 69,656; Switzerland 21,794.
Inorganic chemicals:			
Hydrogen and rare gases	93	258	France 143; Spain 17; Greece 15.
Halogens, excluding chlorine	123	94	West Germany 92.
Inorganic acids, oxygen compounds of nonmetals or metalloids.	111,690	195,753	Greece 96,300; Turkey 33,794; Spain 29,320.
Slag, scale and other nonmetal-bearing waste of iron and steel industry.	26,084	20,996	France 8,671; Switzerland 7,970.
Other nonmetal-bearing ash and slag.	1,436	2,532	West Germany 1,372.
Mineral fuels:			
Asphalt and bitumen, natural	6,968	6,321	United Kingdom 5,223; France 927.
Coal, including briquets	1,412	3,616	Switzerland 1,566; Austria 786.
Coke	120,158	153,716	Austria 42,597; Spain 24,543; Greece 24,020.
Gas, natural and manufactured, including LPG. thousand tons	145	177	Spain 42; France 25; Lebanon 21; United Kingdom 14.
Petroleum:			
Refinery products:			
Gasoline [4] thousand tons	2,503	3,316	United Kingdom 643; Sweden 387; Switzerland 377; Belgium-Luxembourg 358; Netherlands 331.
Kerosine, white spirit, etc. [4] do	764	978	India 203; Pakistan 112; Greece 81; Switzerland 77.
Distillate fuel oil [4] do	6,383	7,645	Belgium-Luxembourg 1,600; Netherlands 1,383; Switzerland 950; France 908.
Residual fuel oil [4] do	6,376	8,172	Belgium-Luxembourg 2,058; United Kingdom 1,510; United States 762.
Lubricants [4] do	272	350	United States 97; Greece 43; Netherlands 41.
Petroleum coke do	14	48	Switzerland 24; Netherlands 22.
Bitumen and other [5] do	153	168	Austria 78; Switzerland 22.
Total [4 5]	16,465	20,677	
Bunker deliveries:			
Gasoline do	130	97	
Kerosine do	382	456	
Distillate fuel oil do	440	606	
Residual fuel oil do	3,696	4,583	
Lubricants do	41	21	
Total do	4,689	5,763	
Grand total refinery products. [5] do	21,154	26,440	
Miscellaneous chemicals from the distillation of coal, petroleum and natural gas.	3,645	3,377	France 2,525; Yugoslavia 396; Turkey 200.

e Estmate. r Revised. NA Not available.
[1] Less than ½ unit.
[2] Includes spiegeleisen, cast iron, sponge, powder, etc.
[3] Including other metals of platinum group.
[4] Excludes bunkers.
[5] Excludes liquefied petroleum gases.

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Table 3.—Italy: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	476,606	534,799	Yugoslavia 260,049; Guinea 82,930; Sierra Leone 74,879.
Oxide and hydroxide	2,729	39,589	Guinea 25,250; Japan 6,305; France 3,237.
Metal and alloys:			
Scrap	27,804	53,179	Canada 11,877; France 10,052; United States 8,804.
Unwrought	33,691	63,235	Norway 15,459; France 10,479; Canada 6,277.
Semimanufactures	15,893	20,617	West Germany 5,754; France 4,104; United States 3,685.
Antimony	437	513	Belgium-Luxembourg 259; China, mainland 84; Yugoslavia 79.
Arsenic oxides and acids	1,866	1,612	France 700; Sweden 420; China, mainland 180.
Beryllium:			
Oxide—kilograms	4,720	2,350	United Kingdom 1,050; France 1,000; West Germany 250.
Metal and alloys—do	950	e 2,000	NA.
Bismuth, unwrought	45	80	Netherlands 32; Japan 21; China, mainland 12.
Cadmium	47	63	Netherlands 22; Japan 11; Australia 9.
Chromium:			
Chromite	100,268	112,259	U.S.S.R. 49,090; Turkey 31,130; Republic of South Africa 13,315.
Oxide and hydroxide	592	882	West Germany 719; Mexico 100.
Metal, all forms	40	32	France 22; United States 7.
Cobalt:			
Oxide and hydroxide	219	258	Belgium-Luxembourg 223.
Metal and alloys, all forms	276	389	Belgium-Luxembourg 281; United States 55.
Copper:			
Ashes and residues	516	659	Switzerland 370; Yugoslavia 247.
Matte	165	223	Belgium Luxembourg 50; United Kingdom 43.
Metal and alloys:			
Scrap	35,596	39,556	West Germany 12,568; France 10,698; United States 3,012.
Blister copper	1,895	2,563	Congo (Kinshasa) 1,126; West Germany 384.
Refined	202,228	215,588	Zambia 52,170; United States 43,853; Congo (Kinshasa) 30,475; Chile 29,890; United Kingdom 18,317; Belgium Luxembourg 11,449.
Master alloy	350	282	Belgium Luxembourg 151; United Kingdom 47.
Semimanufactures	8,617	10,772	Yugoslavia 3,712; West Germany 2,270; Switzerland 1,392.
Gallium, indium, thallium—kilograms	208	979	United States 842.
Germanium—do	479	422	Belgium-Luxembourg 414.
Gold, including alloys. thousand troy ounces	e 1,610	1,193	United Kingdom 1,071.
Iron and steel:			
Iron ore—thousand tons	7,945	8,110	Liberia 1,618; Canada 1,241; Mauritania 1,236; Brazil 1,022; Venezuela 932.
Roasted pyrite—do	68	51	Peru 46; U.S.S.R. 5.
Scrap—do	4,593	4,100	West Germany 1,777; France 1,662; United States 282.
Pig iron, cast iron, and spiegeleisen. do	657	826	U.S.S.R. 203; West Germany 183; Finland 95.
Powder, shot, sponge, and grit. do	9	8	France 4; Sweden 3.
Ferroalloys:			
Ferromanganese—do	79	78	France 25; Republic of South Africa 18; Belgium-Luxembourg 12.
Other—do	35	53	France 15; Yugoslavia 9; Norway 7.
Ingots and other crude forms—do	956	989	West Germany 282; France 219; Japan 112; Belgium-Luxembourg 101.
Semimanufactures:			
Bars, rods (including wire rod) and sections. thousand tons	270	468	West Germany 168; France 104; Belgium-Luxembourg 64.
Universals, plates and sheets. thousand tons	608	941	West Germany 290; France 175; Belgium-Luxembourg 135.
Hoop and strip—do	93	121	France 51; Belgium-Luxembourg 31; West Germany 19.

See footnotes at end of table.

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Table 3.—Italy: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Iron and steel—Continued			
Semimanufactures—Continued			
Rails and accessories ____ thousand tons	11	26	France 17; West Germany 6.
Wire ____ do	15	20	Austria 5; Belgium-Luxembourg 5; Sweden 3.
Tubular products ____ do	48	76	West Germany 29; France 16; Sweden 9.
Castings, unworked ____ do	1	1	Mainly from West Germany.
Total semimanufactures ____ do	1,046	1,653	
Iron oxide and hydroxide	5,736	7,298	West Germany 4,504; France 1,249.
Lead:			
Ore and concentrate	32,762	19,993	Morocco 14,105; Greece 2,400; Algeria 1,900.
Ashes and residues	2,467	1,584	West Germany 768; Switzerland 272.
Oxides	3,495	2,776	Mexico 2,099; Yugoslavia 452; Tunisia 139.
Metal including alloys:			
Scrap	30,872	24,993	West Germany 16,746; Switzerland 4,344; France 1,814.
Unwrought	45,551	45,827	Mexico 9,968; Republic of South Africa 8,392; Bulgaria 5,489.
Semimanufactures	3,374	2,619	Yugoslavia 2,134; France 228; West Germany 225.
Magnesium and alloys:			
Scrap	777	314	West Germany 189; France 90.
Unwrought	171	138	United States 69; West Germany 51.
Semimanufactures	4	30	United States 16.
Manganese:			
Ore and concentrate	106,231	91,778	United Arab Republic 26,487; China, mainland 22,954; Israel 11,396; Gabon 9,522; U.S.S.R. 5,145.
Oxide	526	806	Japan 742.
Metal	511	1,122	France 714; Japan 152; Republic of South Africa 151.
Mercury ____ 76-pound flasks	1,102	1,044	Yugoslavia 522; United States 261; Mexico 203.
Molybdenum:			
Ore and concentrate	1,525	2,005	United States 1,328; Canada 328; Netherlands 214.
Trioxide	35	8	Canada 5; United States 2.
Metal	123	28	Austria 16; United States 5.
Nickel:			
Matte	630	1,745	Canada 1,563.
Metal including alloys:			
Scrap	612	973	United States 276; Switzerland 274; West Germany 96.
Unwrought	8,456	11,160	Canada 4,804; United Kingdom 2,761; Norway 1,724.
Semimanufactures	999	1,598	West Germany 450; United Kingdom 379; Switzerland 252; United States 193.
Selenium	17	17	Japan 7; Belgium-Luxembourg 5; Sweden 4.
Silicon	15	23	France 17; United Kingdom 4.
Silver and platinum:			
Waste and sweepings ____ troy ounces	1,543	16,493	Yugoslavia 12,217; Rumania 2,250 Netherlands 1,447.
Silver ____ thousand troy ounces	17,543	28,663	West Germany 9,942; United Kingdom 8,281; United States 7,832; Switzerland 964; U.S.S.R. 653; Burma 449.
Platinum and platinum-group metals ____ do	115	71	United Kingdom 44; United States 11; West Germany 6.
Tantalum:			
Ore and concentrate	51	25	All from Australia.
Metal	3	4	Mainly from United States.
Tin:			
Oxide ____ long tons	82	38	West Germany 29; Japan 8
Metal including alloys:			
Unwrought and scrap ____ do	5,428	5,909	Malaysia 4,180; Netherlands 1,379.
Semimanufactures ____ do	39	83	West Germany 57; United Kingdom 12.
Titanium:			
Ore and concentrate	85,909	114,900	Norway 60,450; Finland 39,564; U.S.S.R. 7,062; Australia 4,207.
Dioxide	15,979	18,126	West Germany 6,677; United Kingdom 5,057; Belgium-Luxembourg 2,102.
Metal	38	63	United States 23; West Germany 19; United Kingdom 14.

See footnotes at end of table.

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Table 3.—Italy: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Tungsten:			
Ore and concentrate	13	46	Ruanda 30; South Korea 10.
Trioxide	5	7	United Kingdom 6.
Metal	35	74	France 23; Sweden 14; West Germany 13.
Uranium and thorium:			
Ore	1	10	All from Malaysia.
Metal and alloys—kilograms	988	218	United Kingdom 201.
Vanadium pentoxide	206	251	West Germany 200; Republic of South Africa, 51.
Zinc:			
Ore and concentrate	23	4,631	West Germany 4,612.
Ashes and residues	7,764	11,836	West Germany 3,562; Switzerland 3,007; Czechoslovakia 1,586.
Oxide	2,591	3,071	Netherlands 1,251; Poland 573; East Germany 395.
Dust (blue powder)	2,720	2,816	Belgium-Luxembourg 2,602.
Metal including alloys:			
Scrap	4,933	7,114	West Germany 3,750; France 1,382; Switzerland 877.
Unwrought	40,519	55,241	Belgium-Luxembourg 11,387; Bulgaria 7,854; Canada 5,802; Yugoslavia 5,673; Australia 5,405.
Semimanufactures	329	550	Yugoslavia 227; West Germany 114.
Zirconium:			
Ore and concentrate	11,790	14,487	Australia 14,253.
Oxide	304	395	West Germany 270; United Kingdom 57.
Metal—kilograms	1,463	2,604	United Kingdom 1,906; France 406.
Metals, n.e.s.:			
Ores and concentrates	12,578	9,504	United Arab Republic 7,534; Australia 1,053.
Ashes and residues	34,477	20,560	Austria 5,976; France 4,226; Yugoslavia 2,886.
Nonferrous metals	------	33	NA.
Alkali, alkaline-earth and rare-earth metals.	5,614	6,007	West Germany 2,738; France 2,279; U.S.S.R. 899.
Metalloids	18	29	Sweden 28.
Pyrophoric alloys	17	2	All from West Germany.
Oxides, hydroxides of strontium, barium, magnesium.	526	954	West Germany 472; United States 309.
Nonmetals:			
Abrasives:			
Corundum, natural; including garnet	194	143	United States 80; West Germany 61.
Corundum, artificial [2]	877	1,012	France 362; West Germany 242; Austria 228.
Diamond, industrial—carats	10,000	310,000	United States 95,000; Belgium-Luxembourg 50,000; Congo (Kinshasa) 40,000.
Dust and powder of natural and synthetic gems.	value, thousands $1,068	$1,738	Netherlands $579; Belgium-Luxembourg $322.
Emery	1,230	1,349	Greece 1,279.
Grinding stones	2,530	3,428	West Germany 910; United Kingdom 570; Austria 545; France 51.
Tripoli	1,296	1,710	West Germany 1,661.
Asbestos	38,639	43,620	Republic of South Africa 19,140; Canada 12,358; U.S.S.R. 6,935.
Asbestos-cement products	12,695	14,101	Yugoslavia 10,202.
Barite, including witherite	18,724	40,975	Spain 33,983; China, mainland 2,233; France 2,179.
Borates, natural	83,503	73,554	Turkey 61,630; United States 11,919.
Cement	41,571	40,030	France 35,058.
Chalk	8,593	8,658	France 7,700.
Clays and clay construction materials:			
Clay:			
Bentonite	4,891	2,657	United States 2,335; France 296.
Kaolin	268,513	326,465	United Kingdom 242,689; United States 25,401.
Refractory and other	440,985	505,715	France 179,312; West Germany 143,562; United Kingdom 86,170.
Construction materials:			
Refractory	63,687	65,153	West Germany 30,941; Austria 9,291; United States 6,682.
Nonrefractory	8,949	11,167	West Germany 5,561; Switzerland 2,022.
Cryolite and chiolite, natural	611	568	All from Denmark.
Diamond, non-industrial, unset.	value, thousands $2,775	$3,339	Belgium-Luxembourg $1,482; Congo (Kinshasa) $317.
Diatomite	8,087	9,620	Hungary 5,568; United States 1,271.

See footnotes at end of table.

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Table 3.—Italy: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Dolomite	747	1,141	Norway 632; West Germany 226.
Earth pigments	435	997	Greece 625; West Germany 132.
Feldspar (excluding nepheline)	14,773	10,375	Sweden 2,552; Republic of South Africa 1,929; West Germany 1,705.
Fertilizer materials:			
Crude:			
Phosphate rock. thousand tons	1,651	1,877	United States 967; Morocco 430; Tunisia 278.
Potassium salts	36,339	41,643	France 31,755; West Germany 9,308.
Sodium nitrate, natural	-------	1,350	Chile 1,200.
Manufactured:			
Nitrogenous	1,890	2,938	Austria 2,214.
Phosphatic, including basic slag	81,603	155,455	Belgium-Luxembourg 69,243; France 40,235; Yugoslavia 28,296.
Potassic	165,848	223,483	Spain 76,235; Israel 57,064; France 37,147; U.S.S.R. 27,631.
Other	11,828	10,184	Austria 3,645; France 3,358.
Fluorspar	5,676	14,876	France 11,550; Tunisia 3,289.
Graphite	11,156	9,535	Austria 6,215; West Germany 1,727.
Gypsum and plasters	711	1,066	West Germany 615; United States 338.
Lime	1,212	1,354	Yugoslavia 1,293.
Limestone, for flux, cement, etc	30	58	Canada 29.
Magnesite	49,558	45,439	Austria 16,496; Greece 12,938; Yugoslavia 8,308.
Meerschaum, amber, jet	-------	665	France 619.
Mica:			
Crude	2,211	1,898	India 685; United Kingdom 437; Norway 179.
Worked	75	117	France 46; Czechoslovakia 20.
Nepheline	3,383	1,415	Canada 1,115; Norway 200.
Precious and semiprecious stones, n.e.s.:			
Natural value, thousands	$461	$763	India $128; West Germany $124; France $111.
Synthetic, including reconstructed. value, thousands	$623	$884	Switzerland $631; France $218.
Pyrite, unroasted	931,486	958,484	U.S.S.R. 553,839; Cyprus 267,787; Turkey 87,560.
Quartz and quartzite	49,291	57,012	West Germany 16,642; Switzerland 15,468; Portugal 14,250.
Salt	2,198	285	France 171.
Stone, sand and gravel:			
Dimension stone:			
Marble and other calcareous	127,541	132,667	Portugal 74,495; Yugoslavia 24,939; Spain 6,981.
Granite, porphyry, sandstone, etc.	29,560	44,321	Republic of South Africa 18,682; Norway 9,030; Sweden 4,941.
Slate	-------	1,190	West Germany 1,172.
Worked, all types	652	1,062	Portugal 229; West Germany 158.
Gravel and crushed stone	4,873	4,592	France 3,739.
Sand	683,232	697,296	Belgium-Luxembourg 330,272; France 223,691; Netherlands 117,019.
Sulfur:			
Crude	73,334	85,523	Poland 34,458; France 19,800; China, mainland 15,410; Canada 10,617.
Purified	95	232	West Germany 120; France 89.
Talc and steatite	11,276	12,502	Austria 8,194; France 1,597; India 916.
Miscellaneous, n.e.s.:			
Other nonmetallic minerals	43,874	55,565	U.S.S.R. 14,941; Republic of South Africa 13,573; Southern Rhodesia 12,657.
Slag, scale and other nonmetallic waste from iron and steel manufacture. thousand tons	4	4	Mainly from France.
Nonmetallic building materials, unfired.	171	388	Austria 276.
Minerals fuels:			
Asphalt, natural	2,582	2,611	United States 2,094; Albania 407.
Asphalt building products	576	721	France 690.
Carbon black	24,507	20,209	United States 6,873; France 4,446; United Kingdom 4,443.
Coal:			
Anthracite and bituminous. thousand tons	10,310	10,691	United States 7,032; West Germany 1,272; U.S.S.R. 1,111; Poland 685; United Kingdom 286.
Briquets do	107	88	West Germany 65; France 12.
Chemicals do	39	55	U.S.S.R. 15; Czechoslovakia 13; Yugoslavia 5.

See footnotes at end of table.

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Table 2.—Italy: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1965	1966	Principal sources, 1966
Minerals fuels—Continued				
Coke	do	270	342	West Germany 275; Spain 19.
Lignite, including briquets	do	237	233	West Germany 158; East Germany 44; Yugoslavia 24.
Peat, including briquets	do	7	9	West Germany 5; Poland 2.
Petroleum gases (liquefied) [3]	do	10	11	Yugoslavia 6; Hungary 3.
Petroleum:				
Crude	do	67,289	76,140	Kuwait 24,303; Saudi Arabia 17,217 Iraq 8,269; U.S.S.R. 8,220; Libya 8,161; Iran 5,394; Algeria 1,307; Qatar 1,101; United Arab Republic 858; Venezuela 805.
Refinery products:				
Gasoline		109	104	United States 36; Netherlands Antilles 33; Iraq 10.
Kerosine, including white spirit.	do	9	8	Trinidad and Tobago 3; Common Market 3.
Distillate fuel oil	do	207	308	U.S.S.R. 133; Yugoslavia 70; Tunisia 50.
Residual fuel oil	do	1,901	2,462	U.S.S.R. 672; Yugoslavia 378; Venezuela 279; United Arab Republic 172; Rumania 157.
Lubricants, including grease.	do	100	101	United States 46; Belgium-Luxembourg 12; France 9.
Petroleum coke	do	224	271	United States 246; West Germany 11.
Bitumen and other [4]	do	176	191	United States 104; Netherlands Antilles 25.
Total refinery products.	do	2,726	3,445	

[r] Revised. NA Not available.
[1] Excluding artificial corundum.
[2] Includes only material designated for abrasive use.
[3] Mostly produced in petroleum refineries.
[4] Excluding liquefied petroleum gases.

COMMODITY REVIEW

METALS

Aluminum.—Montecatini-Edison S.p.A. opened a new bauxite mine at Boca della Selva in Campania to supplement declining production from the company's San Giovanni Rotondo mine near Foggia. In the Salento peninsula of lower Apulia Società Salento Industria Resine was planning to build an alumina and aluminum sulfate plant near the Poggiardo mine, which was opened in 1966 by Società Mineraria Montevergine. The latter company had three production permits and 12 exploration permits in Lecce province in 1967. Bauxite exploration was also being conducted in Bari by Società Alluminio Veneto Anonima (SAVA); by Montecatini-Edison in Caserta and Benevento; and by the State-controlled mercury producer, Società Mineraria Monte Amiata, in Lecce and in the Sassari area of Sardinia.

In Sardinia, plans for construction of an aluminum reduction plant with an annual capacity of 100,000 tons, originally announced in 1964, were apparently finalized in 1966 and construction was expected to start early in 1967. The development was being carried out by Società Alsar, a company owned 52 percent by a State holding company, and 24 percent each by Montecatini-Edison and Traction Electricité of Belgium.

A second Sardinian development was a 600,000-ton-per-year alumina plant, scheduled to begin production in 1970. The plant will be a joint venture of Società Alsar (55 percent), Metallgesellschaft A.G. of West Germany (20 percent), and Comalco Aluminum of Australia (25 percent). Comalco Co. is jointly owned by Consolidated Zinc Rio Tinto and Kaiser Aluminum, Inc.

In northern Italy, Montecatini-Edison was increasing annual production capacity of its Porto Marghera alumina plant from 140,000 to 210,000 tons. An affiliated company, Società Lavorazione Leghe Leggere (LLL), Italy's principal producer of

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aluminum semimanufactures, was already planning to increase capacity of its 47,000-ton-per-year rolling mill at Fusina that opened early in 1966.

Production of primary metal, by company, was about the same as in 1966 with Montecatini-Edison as the leading producer. At the Mori reduction plant of Montecatini-Edison, which accounted for about one-fourth of the company's aluminum output in 1966, production was temporarily suspended in mid-1967 because of air pollution problems.

Imports in 1967 included 543,000 tons of bauxite; 22,800 tons of alumina; 82,000 tons of ingots; 65,000 tons of scrap; and 26,000 tons of semimanufactures. Exports totaled 34,900 tons of metal and alloys. Total aluminum consumption by use in 1966 and 1967 was as follows:

Product	Quantity of aluminum consumed[1] (thousand tons)	
	1966	1967
Semimanufactures:		
Sheet and strip	92.0	99.0
Bars, sections, tube	42.0	43.0
Wire and cable	10.0	9.0
Total	144.0	151.0
Forgings and stampings	2.0	4.0
Foundry castings	98.0	117.0
Iron and steel products	6.2	6.9
Paste, powder, and other	1.8	2.1
Grand total	252.0	281.0
Of which primary only	171.0	184.0

[1] Including secondary.

Source: Associazione Nazionale Industrie Metalli Non Ferrosi (ASSOMET). I Metalli Non Ferrosi in Italia, Statistiche 1967. Milan, 1968, p. 33.

Copper.—Increased output of copper concentrates in the past 2 years probably resulted from production at a new cupriferous-pyrite mine opened in 1966 at Alagna, near Vercelli in northwest Italy. The Italian firm Miniera di Frangé delineated substantial reserves of copper ore at this locality during the last several years. The main deposits are four subparallel veins, dipping 45 degrees and ranging in thickness from less than 1 to 15 meters. At yearend 1963, reserves reportedly totaled more than 800,000 tons (proved and probable), containing 1.3 to 3.9 percent copper and 11 to 18 percent sulfur.

In an agreement reportedly made with the regional government of Friuli-Venezia Giulia, AMMI planned to build a 30,000-ton-per-year copper-processing plant in Friuli.

Delta Metallurgica Ligure S.p.A., a State-controlled company, reportedly was shifting copper semimanufacture production from Genova to a new plant in Alessandria.

Copper and alloy imports in 1967 totaled 279,000 tons including 198,000 tons of refined copper, 32,000 tons of unwrought alloys, and 34,000 tons of scrap and was valued in total more than $280 million.

Copper consumption by use was reported as follows:

Product	Quantity of copper[1] consumed (thousand tons)	
	1966	1967
Semimanufactures:		
Copper	191.4	206.0
Brass	86.0	96.0
Other alloys	6.1	5.5
Foundry castings:		
Brass	15.9	18.4
Bronze and other	20.5	24.2
Chemicals:		
Copper sulfate	5.6	6.4
Other	1.4	1.3
Miscellaneous	2.1	3.2
Total	329.0	361.0
Of which primary only	195.0	222.0

[1] Including secondary.

Source: Associazione Nazionale Industrie Metalli Non Ferrosi (ASSOMET). I Metalli Non Ferrosi in Italia, Statistiche 1967. Milan, 1968, p. 19.

Iron and Steel.—Italy's iron and steel output and raw material imports again reached record levels in 1967. Apparent consumption of steel rose to 17 million tons, about 17 percent more than in 1966. While domestic steel output increased and productive capacity was well in excess of demand, steel imports exceeded exports by 1 million tons. This apparently resulted from the availability of large quantities of lower priced steel from other EEC countries where demand was relatively depressed. During the first 9 months of 1967, steel imports from EEC sources were 28 percent more than in the comparable 1966 period and steel exports to other EEC countries were 18 percent less.

Raw material imports in 1967 included 10 million tons of iron ore, 5 million tons of scrap, 1 million tons of pig iron, and 152,000 tons of ferroalloys.

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Government-controlled companies accounted for 95 percent of the pig iron and nearly 60 percent of the steel produced by Italy in 1967. The Italsider Company produced nearly 8 million tons of steel, about half in Linz-Donawitz (LD) converters at Taranto and Bagnoli and most of the remainder in open-hearth furnaces at Cornigliano and Piombino. In the private sector, the A.F.L. Falck Company and Fiat S.p.A. produced an estimated 1.1 million tons and 1 million tons, respectively. Most of the output of electric furnace steel was produced by private firms.

Modernization and expansion of production facilities continued. The volume of existing blast furnaces was increased by the Italsider Company at Bagnoli, Piombino, and Trieste and at Aosta by Nazionale Cogne S.p.A.; and improvements in charge preparation increased productivity of pig iron by 5 percent as Bagnoli. Italy's average coke consumption per ton of pig iron produced was the lowest among EEC countries.

In steelmaking, the Cogne Company had

Table 4.—Italy: Salient statistics of the iron and steel industry

(Thousand metric tons unless otherwise specified)

	1966	1967
Production:		
Pig iron:		
Blast furnace	6,082	7,052
Electric furnace	177	242
Steel:		
Open hearth	4,955	5,618
Electric furnace	4,970	5,997
Linz-Donawitz (LD)	3,711	4,272
Oil furnace	3	3
Total steel	13,639	15,890
Ingots:		
High carbon and alloy	1,599	1,843
Other	11,866	13,806
Castings	174	241
Production facilities (operating): [1]		
Blast furnaces, units	15	13
Open-hearth furnaces, do	37	39
Electric furnaces, do	144	133
Consumption:		
Crude steel (apparent), kilograms per capita	275	320
Raw materials:		
For pig iron production:		
Iron ore, direct to furnaces	2,749	3,065
Iron ore, in agglomerating plants	6,481	7,575
Pyrite cinder, in agglomerating plants	202	130
Manganese ore	91	119
Coke:		
In agglomerating plants	433	462
In blast furnaces	3,736	3,877
Kilograms per ton of pig iron produced	596	530
For steel production:		
Iron ore	196	220
Scrap	8,520	10,144
Pig iron	6,382	7,169
Spiegeleisen and carbon ferromanganese	74	83
Energy:		
Petroleum products	1,133	e 1,100
Electricity, million kilowatt hours	9,402	e 10,900
Gas, thousand tons SCE [2]	2,057	NA
Employment (December):		
Salaried, persons	11,248	11,250
Nonsalaried, do	57,093	56,433
Total, do	68,341	67,683
Average direct hourly wage, U.S. dollars	0.92	0.98

e Estimate. NA Not available.
[1] July-September.
[2] Standard coal equivalent at 7,000 kilocalories per kilogram calculated from units reported in billion kilocalories. Data includes natural and manufactured gas.

Sources: (1) Associazione Industrie Siderurgiche Italiane (Milan). Rilevazioni Statistiche. Produzioni, Anno 1966 and Anno 1967: (2) Statistical Office of the European Communities (Luxembourg); (a) Iron and Steel, No. 2, 1968; (b) Energy Statistics, No. 1, 1968.

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nearly completed installation of two 40-ton LD converters at Aosta and at least four electric furnaces were under construction by other companies at Terni, Brescia, and Udine. In major expansion projects planned by the Italsider Company, a third blast furnace and a third 300-ton LD converter will be installed at Taranto by 1970, and at Piombino the open-hearth shop will be replaced by three 80-ton LD converters.

In continuous casting, at least 15 plants were completed or under construction at yearend 1967, including a 150,000-ton-per-year facility for stainless and silicon steel at Terni. Most of the latter plants were designed for billets or bars with lateral dimensions of 4 to 6 inches.

In rolling facilities, La Magona d'Italia was installing a continuous wide strip mill; new bar and rod mills were completed by the Falck and Redaelli companies, and the Italsider Company was expanding annual capacity of rolling mills at Bagnoli to 2.2 million tons and will build a 500,000-ton cold rolling plant at Taranto.

In 1967 the Dalmine Company was building an 80,000 ton-per-year medium-diameter pipe mill at Taranto; assumed supervisions of the 175,000-ton-per-year small-diameter pipeworks at Piombino; and installed a large extrusion press for special steel tubing at Costa Volpino. Italian exports of seamless tube and other pipe, mostly for pipelines being constructed by Ente Nazionale Idrocarburi (ENI) in Africa and the Middle East, increased 25 percent in 1967 and were expected to remain high in 1968. ENI had more than 2,500 kilometers of foreign pipelines under construction in 1967 and had contracted for at least another 1,000 kilometers by yearend.

A $27 million metallurgical research center, financed mainly by the principal firms of the iron and steel industry, was nearing completion at Rome. Known as the Centro Sperimentale Metallurgico, the facility will have a staff of several hundred engaged is basic and applied metallurgical research with emphasis on iron and steel.

Lead and Zinc.—Increasing production of lead and zinc seemed likely because mine and smelter development projects carried on during the last 5 years by principal producers were almost completed in 1967. Several new orebodies were being developed and the organization of mine systems was improved, particularly in Sardinia. Smelter expansions increased Italian primary metal capacity to an estimated 80,000 tons of lead and 150,000 tons of zinc by yearend, with an additional 10,000 tons capacity for each in prospect for 1968.

Despite the improvement in resources, the industry continued to face serious problems, the most pressing of which was further reduction of the protective tariffs authorized by the EEC during the rationalization period. Labor costs and taxes were increased late in 1966 and the need to improve productivity was stressed by industry in 1967. The tariffs, reduced twice in 1966 and again at yearend 1967 were likely to be further reduced, perhaps to the same level as those of other EEC States in 1968.

Tariff levels on lead and zinc from mid–1966 through yearend 1967 were as follows:

	Duty on crude metal imports (U.S. dollars per metric ton) [1]	
	July–December 1966	January–December 1967
Lead:		
From EEC countries	$36.40	$28.00
From other countries	56.00	43.20
Zinc:		
From EEC countries	26.00	20.00
From other countries	40.00	32.00

[1] Converted from lire per kilogram.

In 1967, for metal produced from Italian ores in other countries and re-imported by Italy, no duty was applied to re-imports from EEC countries but a duty of approximately $13.50 per ton was levied on re-imports from other countries.

It was reported in 1967 that the Monteponi-Montevecchio Co. virtually completed the Sartori and Faina projects in Sardinia. On the Sartori project, designed to coordinate production from seven mines of the Monteponi group, the underground ore collecting station and 9 kilometers of feeder drifts were completed. Production of ferruginous calamine concentrates rose sharply in midyear when the company's new Waelz furnace began regular operation. New ore bodies being developed included a 550,000-cubic-meter lead-zinc deposit in the San Marco mine and a

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380,000-cubic-meter deposit of pyritic sphalerite containing 8 to 9 percent zinc in the Funtanaperda mine. Significant discoveries were reported in the Monteponi mine (silver-bearing galena), the Cungiaus mine (calamine), and other localities. On the Faina project at Montevecchio, the new Galileo and Faina shafts were completed; the San Antonio and Peccalina veins were being followed eastward; and a body of copper-lead-zinc ore containing additional values in silver, bismuth and cadmium was found in the Montevecchio mine.

Società Mineraria e Metallurgica di Pertusola reported less favorable results in Sardinia, with ores of relatively low grade being found. The average metal content of ore mined in Sardinia in 1966 was 1.97 percent lead and 1.86 percent zinc. Litigation concerning the company's mining rights at the large Raibl mine continued in 1967; the company's concession was not renewed by the Government in mid-1963 and since that time the mine, which is a major zinc producer, has been operated by AMMI.

During 1967, the Pertusola Company was increasing annual productive capacity for electrolytic zinc at its Crotone plant to 50,000 tons and that for lead at its La Spezia plant to 45,000 tons. At Monteponi, the Monteponi-Montevecchio Co. was producing 70 to 80 tons of fumed zinc from its Waelz furnace and increased electrolytic zinc capacity to about 22,000 tons annually. At Porto Marghera the company was raising electrolytic zinc capacity to 40,000 tons annually and had nearly completed a rolling mill to which molten zinc would be fed directly. The company also developed a process for producing high-purity (99.9999 percent +) metals, including zinc, silver, and bismuth.

Consumption of lead and zinc in 1966 and 1967 by use was as follows:

Product	Quantity of metal (thousand tons)	
	1966	1967
Lead:		
Semimanufactures:		
Tubes	21.5	22.0
Shot	14.3	14.5
Strip, foil, etc	9.5	11.0
Batteries	33.2	38.2
Electric cables	18.0	20.5
Chemical:		
Oxides [1]	15.0	16.8
Other	10.0	14.1
Alloys	5.5	5.8
Miscellaneous	3.0	4.1
Total	130.0	147.0
Zinc:		
Semimanufactures:		
Zinc	10.6	10.4
Brass:		
Bars, sections	33.8	37.3
Others	18.8	21.3
Foundry castings	33.5	40.7
Galvanized products	64.0	66.0
Chemicals	19.4	18.5
Miscellaneous	1.9	2.8
Total	182.0	197.0

[1] Excluding battery oxides.

Source: Associazione Nazionale Industrie Metalli Non Ferrosi (ASSOMET). I Metalli Non Ferrosi in Italia, Statistiche 1967. Milan, 1968, pp. 45 and 55.

Mercury.—The decline in mercury production in 1967 was accompanied by an 8,000-flask drop in exports, mainly reduced shipments to the United States.

The principal producers, Società Mineraria Monte Amiata and Stabilimento Minerario del Siele, reported cinnabar production declines of 5 percent and 9 percent, respectively, in 1967, partly because of strikes and partly because of lower grade ore. Società Mercurifera Italiana, a subsidiary of Montecatini-Edision, reported increased ore production in 1967 but it was accompanied by a slight drop in average grade.

Monte Amiata continued to develop the Bagni San Filippo deposit in Castiglione d'Orcia and was sinking a new shaft during the year. The company operated a new 50-ton-per-day Pacific furnace at Morone in 1967; reported proving "appreciable" new ore reserves at Abbadia San Salvatore in 1966; and continued exploration of mercury deposits near Rome.

The Siele Co. operated two new 50-ton Pacific furnaces in 1967, after eliminating all old Spirek furnaces from its plant. Equipment at the plant included four 50-ton-per-day Pacific furnaces and eight 10-ton-per-day tower furnaces.

Società Italiana Anonima Mercurio, a subsidiary of the Siele Co., operated mines at Cerreto Piano and Zolfiere. Ore at Zolfiere, mined opencast, contained antimony sulfides in addition to mercury.

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NONMETALS

Asbestos.—Società Amiantifera di Balangero strengthened its position as non-Communist Europe's leading asbestos producer. Output of its Balangero mine near Turin was estimated at nearly 2 million tons of crude ore and 100,000 tons of asbestos in 1967. Through modernization of production facilities, the company hoped to achieve a productivity of 800 tons of crude ore per man-shift and a gross output of 2.2 million tons annually.

Italy continued to produce several hundred tons of long-fiber tremolite from mines in Sondrio and Aosta but continued to rely heavily on overseas sources for this material, which constituted much of total asbestos imports.

The use of Italian asbestos as a filler in bituminous paving materials was being promoted in 1967.

Barite.—The continuing upward trend in barite output was mainly due to production from several new mines. In Sardinia, new sources included the Su Benatzu mine opened in 1965 by Miniere Riunite Varesine S.p.A. (MIRIVA) and Baroid International S.p.A. and two mines opened in 1966, the Santa Lucia of Sarrabus Mineraria S.p.A. (SARRAMIN) and the Mont' Ega mine of Società Mineraria Sarda. Combined 1967 output capacity of these mines may have been 30,000 to 40,000 tons annually. Most of the barite was probably processed at Baroid International's San Antioco plant, which includes micronizing facilities.

On the mainland, the Buca della Vena mine was opened in 1966 in Lucca province of Massa-Carrara by Società Industriale e Mineraria Apuana. The ore was processed at a flotation plant near Carrara by Società Bario e Derivati. In 1967 Industrie Minerarie Meridionali S.p.A., a subsidiary of Società Mineraria Monte Amiata, began production of barite from the Mastricarro deposits in Calabria. The company was building a beneficiation plant with a productive capacity of 10,000 tons of barite annually. Full production was expected to start early in 1968.

Barite exports in 1967 totaled 40,900 tons, including 20,000 tons destined for the Netherlands and 15,000 tons for the United States. Barite imports totaled less than 7,000 tons.

Construction Materials.—The slump in the construction industry, which had depressed demand for cement, stone, and other building materials in 1965 and 1966, appeared to continue in 1967 although a recovery began in the latter half of the year and a 10-percent rise in nonresidential construction was reported. The relatively high level of cement production in 1967, and the absence of a severe decline in stone industry output in 1966 and 1967 appeared to be supported by public works projects, particularly highway construction. The stone industry was also aided by a continuing growth of export markets in West Germany and France and by railroad construction in Italy.

Cement.—Cement output in 1967, up about 17 percent compared with that of 1966, equaled 84 percent of productive capacity. New plant developments in 1967 were of limited scope, as major expansions had been completed during the previous 3 years. Unione Cementi Marchino completed modernization of its Rome plant, expanding annual capacity to 800,000 tons. The company operates several other plants and normally accounts for about 10 percent of output. Cementerie del Tirreno, a State-owned subsidiary of the FINSIDER group, produced about 3 million tons of cement in 1967 from plants at Taranto and Bagnoli.

Dimension Stone.—Production and exports of marble increased in 1967 and probably generated the rise in overall output in the building stone industry. Government statistics indicated a 10-percent rise in marble production and an 8-percent increase in exports. Marble usually accounts for 60 to 80 percent of the industry's output and exports of building and ornamental stone. While production data for granite, travertine, and other types of dimension stone were not available, exports of these varieties in 1967 were slightly below 1966 levels. Total stone exports in 1967 were valued at about $82 million.

Annually increasing exports coupled with Government public works projects have enabled the industry to maintain an appreciable level of output despite the domestic recession in private building construction during 1965–66 and other potentially restrictive developments in 1966–67, which included increased costs from a new 3-year labor contract negotiated December 1, 1966, additional taxes

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imposed on December 31, and the Suez Canal closure in mid–1967. The latter event was expected to result in permanent loss of export markets in southern Africa, Asia, and Oceania which collectively accounted for about 10 percent of the value of the industry's exports.

West Germany and France continued to be the principal export markets in 1967, followed by the United States. Until 1965, the United States was regularly the principal foreign market for Italian stone; the shift in market positions resulted chiefly from a rapid growth of demand for finished stone products in the Common Market countries. Trends in exports of building and ornamental stone to these countries are indicated in the following tabulation:

Stone form	Thousand metric tons					
	United States		West Germany		France	
	1962	1966	1962	1966	1962	1966
Unworked (blocks)	19	7	18	22	16	16
Sawed	21	16	43	36	6	21
Worked or finished	32	32	10	122	16	84
Byproducts [1]	23	11	47	113	16	40
Total	95	66	118	293	54	161
Value, millions	$13.7	$12.6	$6.5	$20.7	$3.6	$15.6

[1] Granules, chips, powder, etc.

Source: Association of Italian Marble and Related Industries. Relazione all' Assemblea Generale del 30 giugno 1967. Rome, 1967, pp. 66–80.

Building and ornamental stone imports in 1967 totaled about 190,000 tons, mainly from Portugal and Yugoslavia, and were valued at $11 million. Imports of granite from South Africa in 1967 remained at the 1966 level. About two-thirds of the total imports consisted of marble or similar stone.

The dimension stone industry employed about 55,900 persons.

Other.—Output of other stone, sand, and gravel was apparently little affected by the decline in building construction during 1965 and 1966 because of the heavy demand from public works projects which apparently continued in 1967. Output of stone for railroad ballast, road and building foundations, paving, and similar uses in 1966 was reported by Associazione Industria Marmifera Italiana (AIMI) as 54 million tons, in addition to 200 million tons of sand and gravel. While these figures were higher than those reported for earlier years by Government publications, AIMI emphasized the difficulty in collecting accurate production statistics because of the numerous independent producers.

Employment in 1966 was estimated at 14,800 in stone production and 5,200 in sand and gravel operations.

Fertilizer Raw Materials.—Production at the San Cataldo and Palo mines was 7 percent higher than in 1966. Substantial production facilities were available at the Pasquasia and Corvillo mines but there appeared to be delays in construction of transportation and processing facilities. Aggregate annual production potential of Sicilian mines in 1967 was probably more than 2.7 million tons. The Racalmuto mine, being developed by Montecatini-Edison, was expected to begin production in 1968.

Fluorspar.—A high level of fluorspar production was maintained in 1967 as exports increased 54 percent compared with 1966. Shipments to the United States totaled more than 76,000 tons and were valued at $2.7 million. Imports of fluorspar in 1967 rose to 32,800 tons, which included 19,400 tons from France.

The increase in production since 1965 was mainly due to output from the Cagliari district of Sardinia where the Santa Lucia and Su Benatzu mines were opened during 1965–66. Another mine was opened in 1966 in northern Italy, south of Trento at Vallarsa, by Silicifera Tridentina, S.p.A.

Most of the fluorspar produced in northern Italy was mined by companies belonging to the Montecatini-Edison group, including Società Prealpina Montefluoro and Società Mineraria Presolana.

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Pyrite and Sulfur.—Italy continued to rely heavily on pyrite for its sulfur requirements, partly because of import restrictions on elemental sulfur and partly because of difficulties in obtaining supplies on the international market. Pyrite imports rose 25 percent to 1.2 million tons in 1967, including 762,000 tons from the Soviet Union and 310,000 tons from Cyprus.

A 10-percent rise in output from the Maremma mines of Montecatini-Edison in Tuscany provided much of the increase in Italian pyrite production. This company's pyrite-processing plant at Scarlino operated at capacity in 1967, producing an estimated 750,000 tons of sulfuric acid and 350,000 tons of pelletized iron oxide. Exploration was being conducted for new pyrite resources in the Maremma area: existing reserves were reportedly sufficient for only about 15 years at the current rate of extraction.

In Sicily, the number of active sulfur mines was reduced from 24 to 18; most mines were operated or controlled by the Sicilian Mining Agency (EMS), including the Trabonella and Floristella mines which were reportedly transferred to the Agency in 1967. Under the rationalization program, the number of mines will be reduced to 13 by 1970, with a planned total annual output of 900,000 tons of crude ore, all to be used for sulfuric acid production. The large fertilizer plant scheduled for completion by 1969 at Villarosa by EMS, ENI, and Montecatini-Edison reportedly will be able to utilize Sicily's entire sulfur output as well as part of the region's potash production.

Elemental sulfur imports in 1967 declined to 76,000 tons, of which half was supplied by France and 21,000 tons by the United States. The EEC Commission authorized Italy to continue the restrictions on crude sulfur imports that have been exercised since 1965 under which Italian end-users are permitted to import sulfur in quantities directly proportional to purchases of domestic sulfur at a price not to exceed $76 per ton. The Italian Sulfur Agency (EZI) continued to control allocations of Sicilian sulfur in 1967.

MINERAL FUELS

Coal.—The anticipated increase in coal output from Sardinia's Seruci and Nuraxi Figus mines was again delayed in 1967 although modernization reportedly was completed in 1966. Output of these mines, Italy's only bituminous coal producers in 1967, was used at the Porto Vesme powerplant.

Although coal imports rose to 12 million tons in 1967, those from the United States again declined, accounting for about 45 percent of the 1967 total compared with 80 percent in 1965. Imports from West Germany increased to 3 million tons, compared with 500,000 tons in 1965.

Consumption of coal in coking plants apparently declined to about 7.9 million tons but consumption in thermal powerplants increased by 50 percent to 1.8 million tons. At the 1,200-megawatt La Spezia thermoelectric plant coal transport capacity was increased to 1,500 tons per hour and another 600 megawatts of generating capacity was being installed for service in 1968.

Lignite.—Completion of the Mercure and Bastardo thermoelectric projects in southern Italy led to the sharp increase in lignite production.

Natural Gas.—Natural gas production again increased in 1967, but ENI reported reserves totaling only 109 billion cubic meters early in 1967 and private company holdings in peninsular Italy and Sicily probably totaled only 20 billion cubic meters. Continuing exploration was likely to find additional reserves but the likelihood of a major increase seemed small. The Government was actively seeking long-term contracts with foreign suppliers to provide about 10 billion cubic meters annually. A 20-year contract for an annual import of 3 million cubic meters from Libya was negotiated in 1965, and in 1967 protracted negotiations were underway with the Soviet Union for Siberian gas.

For the Libyan gas, Esso Standard Libya contracted with Italian companies in 1967 to build liquefaction facilities at Marsa el Brega, Libya. Italian shipyards were building the necessary tankers, and construction of a 140-kilometer pipeline from LaSpezia to Cortemaggiore was underway. Delivery was expected to begin early in 1969.

Other gas pipelines under construction in Italy during the year included 400 kilometers by ENI companies and a 250-kilometer line by Gasdotti del Mezzogiorno from Larino to Frosinone, which was completed by yearend.

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Nuclear Energy.—Italy's plans for additional nuclear powerplants included a 600-megawatt plant to be ordered in 1968, and which reportedly will be built near Vercelli, with completion scheduled for 1972. Three more plants with a total generating capacity of 2,000 megawatts will reportedly be ordered by 1970. The prospective increase in requirements for fuel led the Italian Atomic Energy Agency to resume exploration for uranium.

Petroleum.—Main developments in the petroleum industry in 1967 included marked changes in sources of crude oil imports and increased transportation costs to refiners, arising from closure of the Suez Canal, and included enactment of a law governing exploration and development of oil and gas resources in areas of the Italian Continental Shelf.

Crude oil imports rose to 86 million tons in 1967. While Kuwait and Saudi Arabia remained the principal suppliers, interruptions of pipeline deliveries and of shipments through the Suez Canal in mid-1967 resulted in sharply increased imports from Libya, the Soviet Union, and other countries west of Suez, as shown in the following tabulation:

Source	Change in volume of crude oil imports in 1967 compared with 1966	
	Thousand tons	Percent
East of Suez:		
Kuwait	−3,636	−13.7
Saudi Arabia [1]	−1,806	−9.8
Iran	−975	−17.8
Iraq	+1,339	+15.4
United Arab Republic	−496	−59.5
West of Suez:		
Algeria	+118	+7.5
Libya	+6,735	+77.5
U.S.S.R.	+2,640	+33.3
Albania	+36	+210.0
Venezuela	+972	+96.0

[1] Including Qatar and Abu Dhabi.

Source: Ministero dell' Industria, del Commercio, e dell' Artigianato (Ministry of Industry, Commerce and Handicrafts, Rome). Bollettino Petrolifero, v. 10, No. 12, December 1967, p. 11.

The effective period of a 10-lire-per-liter tax on gasoline that was originally imposed to help defray the cost of flood control programs was extended for 1 year to December 31, 1969, to compensate oil companies for increased transportation costs resulting from the Suez Canal closure.

The offshore law went into effect in July. It divided the Italian continental shelf area into five zones and required ENI to perform geophysical surveys of each zone by certain dates. After surveying each zone ENI may reserve 25 percent of the area for itself and the remaining 75 percent will be opened for concessions to other companies. ENI will hold a majority interest in any partnership formed for joint explorations in its reserved area. The law requires all oil and gas to be offered for sale to ENI before other marketing arrangements are made, moreover all gas must be marketed in Italy and oil may be exported only with Government permission. ENI is also to receive royalty in the form of 5 percent of all gas and 8 percent of all oil produced. The five zones, with dates for completion of surveys are: Zone A (Adriatic, north of 44 degrees latitude; September 1967); B (Adriatic, between 44 and 42 degrees latitude; April 1968); C (areas adjacent to Sicily; October 1969); D (Adriatic and Ionian Seas, south of 42 degrees latitude; December 1970); and E (Tyrrhenian Sea and Sardinia; December 1970). After geophysical maps are turned over to the Ministry of Industry by ENI, copies may be obtained at reproduction cost by interested parties.

By yearend ENI and Shell Italiana were jointly drilling in Zone A and a partnership of Fiat S.p.A. and the Gulf Oil Corp. had applied for exploration concessions; offshore boundry negotiations were underway between Italy and Yugoslavia; and the regional governments of Sicily and Sardinia were seeking jurisdiction over offshore exploration in their respective areas.

In crude refining, the 4-million-ton Shell refinery at Taranto was completed in 1967 and expansions elsewhere in Italy increased authorized refining capacity by yearend to about 90 million tons annually, not including the 30-percent legal reserve. Another 11 million tons of new capacity was authorized during the year. To avoid overcapacity and to reduce the cost of maintaining unused facilities, the Government was considering abolition of the reserve requirement. This step, if taken, would increase authorized refinery capacity to about 130 million tons annually.

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The Mineral Industry of Japan

By B. H. Lim,[1] R. A. Pense [2] and K. P. Wang [3]

Japan's mineral industry ranked about fourth in the world in terms of value of minerals produced plus value added by processing. This figure in 1967 was on the order of $6.5 billion, about $1.4 billion higher than in 1965. This growth resulted from an accelerated expansion of Japan's mineral based industries during the last 5 years. While the country's domestic mineral resource base was only of moderate significance in 1967, its metallurgical and petroleum refining industries, based heavily on imported raw materials, had become very large and diversified to meet the demands of the Japanese industrial-manufacturing economy. Growth of production by industrial sectors is shown in the following tabulation:

Industry	Production index (1965 = 100)	
	1966	1967
Mining	105.8	104.3
Manufacturing	113.4	136.0
Chemicals	113.0	132.3
Petroleum and coal products	114.8	138.2
Ceramics	109.0	127.6
Iron and steel	115.6	149.6
Nonferrous metals	112.7	135.9
All industries	113.1	134.8

Source: Japanese Government, Economic Planning Agency, Tokyo, Japan. Economic Statistics. V. 2, No. 3, p. 3.

Japan's gross national product (GNP) in 1967 amounted to $115,700 million as compared with $97,477 million in 1966, an increase of 18.7 percent. If prices are adjusted to real terms, the increase amounted to 13.7 percent, still a very significant expansion and one of the highest if not the highest, for an advanced economy. This market expansion was attributed chiefly to gross domestic capital formation, which went from $33,239 million at yearend 1966 to $44,402 million by the end of 1967.[4] This growth, in general, was centered around the country's basic mineral and related industries; the iron and steel, petroleum refining, and nonferrous metals sectors all had capital increases of 20 percent or more above their 1966 levels.

During the second half of the year, when many of the investment projects were completed and placed in production, an oversupply situation developed; thus, much of 1967 production went to inventories, which increased from $2,560 million in 1966 to $6,364 million in 1967. To alleviate the oversupply, the Government purchased large quantities of construction materials for public projects and urged entrepreneurs to reevaluate investment plans for 1968 in the hope that scaled down investment would allow demand to catch up with supply. This procedure was preferred over market equilibration via the price mechanism. Such cooperation was sought especially from the Nation's iron and steel producers who recorded an unprecedented growth during the year from their already-large base.

Growth in basic industries, generally, was not matched in consumer industries. The imbalance resulted in soaring prices. Japan's wholesale price index went from 103.6 in 1966 to 105.4 in 1967 (1965 = 100) while the consumer price index went from 104.8 to 109.1, yielding an inflationary pressure of slightly more than 4 percent for the year. Higher consumer prices were particularly prominent during the second half of 1967 and the monthly index stood at 112.4 in December.

The rapid industrial growth also influenced Japan's international trade balance, which in 1967 showed a $1,222

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[4] Bank of Tokyo Weekly Review. V. 22, No. 18, May 13, 1968.

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million deficit. In large part, the deficit resulted from imports of mineral raw materials, especially fuels and ferrous and nonferrous ores and concentrates, prices of which edged generally upward in 1967.

Japan's foreign investment increased nearly 40 percent in 1967, and totaled $627 million compared with $450 million at yearend 1966. The increase reportedly was largely due to borrowings from foreign financial institutions, which totaled $459 million in 1967 compared with $335 million in 1966. New overseas net investment during 1967 totaled $153 million compared with $112 million in 1966.[5]

Few new metal and oil refining plants came into operation during 1967, although many companies were busy expanding existing installations, continuing construction on projects previously started, or planning new facilities in anticipation of rising demand both at home and abroad. In many cases the Ministry of International Trade and Industry (MITI) intervened to regulate the growth rate to prevent overexpansion. This met with varying degrees of success but was most effective in the steel industry.

The Mizushima steel plant of Kawasaki Steel Corp., which began rolling activities in 1966, became a fully integrated plant in April when its first blast furnace was blown in. Yawata Iron and Steel Co. speeded work to bring its new Kimitsu plant into integrated operation by yearend 1968. The lead smelter of Mitsubishi Cominco Smelting Co. and the lead-zinc smelter-refinery of Sumiko Imperial Smelting Process Co., both placed on stream during 1966, moved towards full scale operation in 1967, while construction continued on a new jointly owned lead-zinc smelter-refinery due in 1968. Sumitomo Chemical Co., Ltd., began operation of a new aluminum refinery in June; Nippon Light Metal Co., Ltd., was about to build a new refinery in Hokkaido; and a group of Mitsui companies were planning a refinery on Kyushu. In the petroleum industry, approximately 125,000 barrels per day of crude refining capacity was added and three new refineries were scheduled to go on stream in 1968.

In December the Japan Rare Metal Corp. was established with MITI financial support in order to stabilize supplies and prices of those imported metals which have been subject to sharp fluctuations in recent years. Formed by 22 steelmakers and fabricators, 8 ferroalloy and 4 nickel producers, the firm had an initial capital of about $2 million. A two month's supply of nickel and molybdenum are to be stockpiled first, followed probably by tungsten and cobalt.

In February 1968 the Overall Energy Research Council (OERC), established in 1965 as an advisory body to MITI, made its first policy recommendations for energy resources development. It estimated that energy demand, growing 10 percent annually, would increase 2.6 times by 1985, by which time imported energy, accounting for nearly two-thirds of total supply in fiscal 1965 (April 1965 to March 1966) would constitute almost 90 percent of the total. Petroleum, nearly all imported, was expected to supply about 75 percent of total energy in 1985, compared with 58 percent in fiscal 1965. OERC recommended that strenuous efforts be made to free Japan's crude oil supplies and prices from foreign company control. This was to be accomplished by giving sufficient financial assistance to Japanese companies to find and develop overseas sufficient oil to provide 30 percent of demand by 1985. Government intervention was also recommended to extend Japanese control over refining and marketing operations in Japan.

Coal's share of total energy demand was expected to drop from 27 percent in fiscal 1965 to less than 10 percent in 1985. Coal demand was to be maintained by price subsidies to major consumers, more complete rationalization of production facilities, and streamlining industry management. Extensive recommendations were also made concerning the development of nuclear power—virtually nonexistent in fiscal 1965 but scheduled to supply about 10 percent of Japan's primary energy in 20 years—and hydroelectric power which was expected to fall from somewhat more than 10 percent of overall supply to somewhat under 5 percent.

Government support of domestic mining mounted in 1967. By far the largest subsidy went to coal, where approximately $145 million was appropriated for direct support alone during fiscal 1967—about 70 percent more than in fiscal 1966. Appropriations for natural gas exploration during fiscal 1967 were stepped up to

[5] Bank of Tokyo Weekly Review. V. 22, No. 3, Jan. 29, 1968.

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$3.3 million. Through the Agency for Promoting Metallic Minerals Prospecting, the Government was prepared to make available about $7.2 million in fiscal 1967 in low interest loans to large companies to pay the major portion of prospecting for copper, lead, zinc, and manganese. The Agency also planned to spend about $1.2 million for its own preliminary surveys in 14 locations and detailed investigations at 3 sites for these metals. About $1.2 million was earmarked in fiscal 1967 under the Law Concerning the Promotion of the Modernization of Medium and Small Enterprises to subsidize up to 50 percent of the prospecting costs of smaller companies searching for deposits of 11 metallic and 6 nonmetallic ores. Under the "Decremental Exemption System" initiated in 1965, allowing mining companies to retain a stipulated portion of their ore sales income tax-free for the purpose of prospecting, about $33 million had been accumulated by 1967, of which about $18 million had been expended.

The trend towards rationalization and consolidation in the minerals industry became more pronounced. Previous moves in this direction, encouraged by the Government and aimed at making the processing sector more competitive internationally, involved joint ventures between major nonferrous metal producers in establishing new plants. The Onahama copper smelter-refinery (1965), the Harima lead-zinc smelter refinery (1966), and the Hachinohe lead-zinc smelter-refinery scheduled for operation in 1968 were projects of this nature. The 1966 opening of the Cominco lead smelter-refinery, in which a Canadian firm held a 50 percent interest, apparently represented the first time that a non-Japanese firm had held as much as one-half interest in a major nonferrous processing installation, however. This was followed in 1967 by the commencement of Japan's first nickel oxide plant with foreign participation.

During 1967, moreover, outright mergers between Japanese steel companies began. Principally, because of the country's tax laws and financial system, industry's capital structure is relatively weak compared to foreign counterparts. This has been felt most keenly in the steel industry where the problem of generating or obtaining the huge amounts of capital necessary to finance future growth has assumed greater proportions. Total fiscal 1967 new capital investment in steel was estimated at $1 billion of which the equivalent of about 8 percent was secured abroad. The desire for greater financial stability was cited as one reason for the merger in 1967 of Tokai Iron and Steel Co., then the seventh largest steel producer, and Fuji Iron and Steel Co., the second largest, and was undoubtedly a factor in opening negotiations for a merger of Fuji and Yawata Iron and Steel Co., the top-ranking producer.

Japanese activities overseas in support of its domestic mineral consuming industries accelerated during 1967. Major investment commitments were made by Japanese copper refiners in copper mining in Canada and Republic of the Congo (Kinshasa) and negotiations were initiated for the purchase of a large quantity of ingot from Zambia. A contract was signed late in 1967 by smelter operators for the annual import from one Canadian company of concentrates equal to twice the entire quantity of lead imported in 1966 and more than half the total amount of zinc. The quasi-Government Overseas Mineral Resources Development Co., Ltd. (OMRDC), with 50 percent private participation by some 22 nonferrous metal mining and smelting concerns, conducted exploration abroad in areas where private companies were inhibited by the high risks involved, such as in Malaysia, where rights were obtained to a large low-grade copper deposit in Sabah.

In October the Japan Petroleum Development Corporation was set up to assist Japanese oil companies in locating and developing foreign crude oil sources. About $213 million was made available during the first year for nine projects in Australia, Canada, Indonesia, Malaysia, and the United States (Alaska). Independent of these projects three Japanese oil companies secured in December an offshore concession in Abu Dhabi, Trucial States, believed capable of becoming a major oil find. Major purchase agreements were made by Japanese interests with natural gas producers in Brunei and the United States (Alaska). Within the next few years these will result in importing, in liquefied form, the equivalent of 120 billion cubic feet annually, almost twice the 1967 level of indigenous supply.

Total private Japanese overseas invest-

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ments in mining (including petroleum and natural gas) was estimated during 1967 to have reached $367 million since the end of World War II. In addition, Japanese iron and steel companies have been active in developing plants in foreign countries. In 1967 Japanese-financed rolling mills were under construction or were planned in New Zealand, the Philippines, South Korea, and Thailand, while a completely integrated partially Japanese-backed plant went on stream in Malaysia.

PRODUCTION

In 1967 Japan was a strong third as a world steel producer, after the United States and the Soviet Union. Its relative position in refined petroleum and cement was the same as in steel. In pyrite and pyrophyllite, Japan led the world and in titanium, it was second only to the United States. In fertilizers, ferroalloys, aluminum, copper, lead, and zinc, Japan occupied third to sixth position.

Value of Japan's mineral industry output in 1967 was on the order of $6.5 billion as compared with Japan's gross national product (GNP) of $115.7 billion. The corresponding estimates for 1965 were $5.1 billion for mineral output and $83.9 billion for GNP. Thus, growth in minerals and metals roughly paralleled overall economic growth.

While Japan's mineral processing industries, notably iron and steel and nonferrous smelting industries, expanded rapidly in the last few years, the domestic metal mining industry made only a modest advance. Gains made in nonferrous metal mining can be mainly attributed to the increased exploration of the "kuroku" (black) ores. Most nonmetals headed by cement and limestone, made significant progress.

Preliminary figures on mine and metal output value for 1966, were as follows:[6] $267 million for metallic ores; $138 million for nonmetallics (excluding cement and salt); $526 million for hard coals; and $53 million for lignite, crude oil, and natural gas. Corresponding data for 1967 were not available. For 1966, the source also reports $837 million for refined metals; this figure double-counts indigenous metals and does not include iron and steel, aluminum, and many other metals derived mainly from imported raw materials. Other sources reported cement output valued at $480 million for 1966 and $568 million for 1967, but this would double count limestone, to some extent (reported by Mining Yearbook of Japan at $65 million for 1966). To arrive at the total mineral industry output value stated previously, it was necessary to consider the very large factor of value added for steel, other metals, and refined petroleum. Clearly, Japan's influence in the mineral and metal field goes far beyond the limited domestic resource base. In fact, Japan owns an increasing array of mineral properties abroad, either wholly or in part, which are like domestic properties in some respects.

[6] Ministry of International Trade and Industry. Mining Yearbook of Japan 1966. pp 70–71.

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Table 1.—Japan: Production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Aluminum:					
Alumina	511	589	626	662	710
Metal, ordinary	222	264	292	335	379
Metal, superfine tons	1,869	r 1,938	r 1,835	r 2,142	2,881
Oxide, fused	34	37	30	28	38
Antimony:					
Mine tons	192	503	183	77	58
Regulus (metal) do	2,067	2,324	r 1,411	1,942	2,483
Oxide do	1,175	1,615	1,129	1,368	1,861
Arsenic (white) do	820	499	479	547	643
Bismuth, metal do	373	506	611	r 544	634
Cadmium, metal do	1,012	1,215	1,480	r 1,756	1,899
Cerium do	122	r 164	127	153	90
Chromium:					
Concentrate, almost all low-grade	44	44	42	33	45
Metal tons	456	r 976	1,090	611	1,325
Cobalt do	20	16	4	---	---
Copper:					
Mine	107	106	107	111	118
Metal, primary electrolytic	295	342	366	405	470
Metal, secondary	89	118	122	r 115	148
Germanium, metal tons	14	24	18	15	21
Germanium, oxide do	14	r 21	22	r 14	23
Gold, refined thousand troy ounces	433	460	519	555	678
Indium do	151	229	281	273	560
Iron and steel:					
Direct smelting ore	1,130	1,132	1,119	r 1,110	1,133
Iron sands	1,295	1,425	1,391	r 1,289	1,375
Pyrite sinter	1,767	1,926	1,965	r 2,021	1,965
Pig iron	19,936	23,778	27,502	32,018	40,095
Ferroalloys:					
Ferrochrome	82	137	117	r 137	197
Ferromanganese	166	212	221	r 237	303
Ferromolybdenum tons	1,017	1,429	1,247	r 1,712	2,036
Ferronickel	47	78	74	r 72	107
Ferrosilicon	94	114	121	r 139	146
Ferrotungsten tons	760	1,178	726	r 674	1,105
Ferrovanadium do	1,287	1,128	1,057	r 1,556	1,400
Silicomanganese	e 115	e r 115	e r 115	NA	NA
Steel ingots	31,501	39,799	41,161	47,784	62,154
Rolled steel, hot rolled:					
Ordinary	23,307	29,381	30,972	35,760	45,934
Special	2,310	2,532	2,412	3,196	4,426
Lead:					
Mine	53	54	55	63	64
Metal, primary smelter	92	97	108	119	150
Metal, secondary refined	68	61	57	60	36
Magnesium, primary only tons	2,439	2,937	3,785	r 5,291	6,748
Manganese:					
Ore, mostly low-grade	277	285	303	r 321	340
Oxide	10	r 12	21	23	35
Metal, electrolytic	5	5	6	5	6
Mercury 76-pound flasks	4,902	4,960	4,699	r 4,846	4,612
Molybdenum:					
Mine MoS_2 tons	553	r 468	r 461	r 410	422
Metal do	134	r 146	105	142	204
Nickel, metal	6	7	7	7	7
Palladium troy ounces	1,326	1,875	2,952	5,495	3,327
Platinum do	1,714	2,199	2,466	2,733	3,072
Selenium tons	142	148	158	192	191
Silicon, high-purity do	11	14	12	20	36
Silver, electrolytic thousand troy ounces	15,214	15,966	16,658	18,327	22,173
Tantalum tons	5	11	6	7	12
Tellurium do	6	3	9	10	13
Tin:					
Mine long tons	857	796	837	971	1,170
Metal, electrolytic and fire do	1,976	1,954	1,610	1,836	1,666
Titanium:					
Slag tons	874	1,960	2,894	r 3,508	5,709
Metal do	1,759	2,993	4,840	r 6,432	7,840
Tungsten:					
Concentrate do	651	715	594	586	691
Metal do	516	703	622	675	1,004

See footnotes at end of table.

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Table 1.—Japan: Production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals—Continued					
Zinc:					
Mine	198	216	221	253	262
Metal, electrolytic	177	202	245	r 279	311
Metal, distilled	87	84	97	r 120	148
Metal, high-purity	18	30	26	45	57
Sulfate	26	29	28	31	35
Oxide	r 33	r 35	36	39	42
Zirconium—kilograms	r 53	r 66	102	r 60	33
Nonmetals:					
Asbestos, mostly crysotile	17	16	15	r 19	24
Barite	38	40	42	40	38
Bromine—tons	r 3,552	4,681	3,962	5,056	6,002
Cement, all types	29,948	32,981	32,689	38,265	42,993
China clay (kaolin)	99	107	89	r 118	150
Dolomite	1,752	1,838	1,674	r 1,711	2,138
Feldspar and aplite	r 261	r 317	r 336	r 344	374
Fire clay	813	r 920	r 1,011	r 1,042	1,409
Fluorspar	21	19	17	r 14	12
Graphite, mostly crystalline—tons	2,998	2,450	2,252	r 2,203	1,730
Gypsum	783	751	650	598	587
Iodine—tons	1,686	2,025	2,193	2,627	2,910
Lime (quicklime)	1,385	1,631	1,692	2,013	3,082
Limestone	53,857	60,603	61,363	r 71,450	80,904
Phosphates (superphosphates)	1,663	1,661	1,550	1,191	1,195
Potash, carbonate	6	8	7	10	12
Pyrite, pyrrhotite and cupriferous pyrite	3,894	4,146	4,323	r 4,734	4,527
Pyrophyllite (powder)	289	321	r 319	r 365	411
Salt	747	893	848	850	973
Silica:					
Sand	1,985	2,129	2,316	2,589	3,328
Stone	2,820	2,999	3,049	3,112	4,045
Sulfur, refined from ore	223	241	213	230	254
Sulfur, recovered from oil	12	19	37	53	62
Sulfur ore, for making acid	r 548	r 586	1,112	r 1,155	NA
Sulfuric acid	4,991	5,372	5,655	6,031	6,280
Talc	68	r 98	93	106	120
Mineral fuels:					
Carbon black	80	111	123	r 135	176
Coal:					
Anthracite	1,798	1,709	1,630	1,612	1,514
Bituminous	50,254	49,220	47,904	49,736	45,532
Lignite	914	691	573	452	366
Coke from coal:					
From coke ovens	12,066	13,697	15,001	17,032	21,294
From gas plants	3,374	3,721	3,670	3,713	4,165
Fuel briquets	4,300	4,082	3,918	r 4,054	3,839
Natural gas—million cubic feet	r 59,845	r 65,640	r 62,861	r 64,509	66,734
Peat e	75	70	70	70	70
Petroleum:					
Crude oil (including natural gasoline) thousand 42-gallon barrels	5,646	4,818	4,726	5,463	5,539
Refinery products:					
Gasoline—do	58,370	62,507	68,611	79,225	90,806
Naphtha—do	20,651	31,142	45,929	56,819	67,649
Jet fuel—do	4,299	6,344	8,105	9,425	15,340
Kerosine—do	r 24,844	28,395	34,922	39,808	54,394
Distillate fuel oil—do	40,752	50,730	56,747	69,778	81,450
Residual fuel oil—do	187,899	228,133	262,591	313,143	382,061
Lubricating oils—do	5,403	r 6,758	r 7,273	r 8,234	9,348
Grease r—do	224	237	243	267	297
Paraffin r—do	409	526	536	643	634
Asphalt r—do	4,111	7,867	9,207	11,368	12,507
Liquefied petroleum gas r—do	12,057	24,064	32,133	38,909	45,236
Petroleum coke r—do	383	464	456	411	396

e Estimate.
r Revised.
NA Not available.

Sources: Ministry of International Trade and Industry. Mining Yearbook of Japan, 1963–66; Petroleum Yearbook of Japan, 1963–66; Petroleum Statistical Weekly, issue 42–12.

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TRADE

The value of total Japanese mineral commodity trade reached a new high of $6,921 million in 1967, while total Japanese merchandise trade value reached $22,105 million. However, Japan had a trade deficit of $1,222 million for the year as compared with a trade surplus of $254 million in 1966.

The United States remained Japan's largest trading partner in 1967. Japanese exports of all commodities to the United States totaled $3,012 million, and similar imports from the United States totaled $3,212 million. Japan's mineral product exports to the United States, mainly iron and steel, were significant, but its mineral imports from the United States were not particularly important valuewise, being limited to phosphates, potash, molybdenum, scrap, iron ore, special lubricants, and coking coal.

Overall, Japan's largest mineral imports in 1967 were metalliferous ores and scrap, mineral fuels and lubricants valued at $1,600 million, and nonferrous metals valued at $590 million. Chief iron ore suppliers were India, Chile, Peru, and Malaysia, with Australia looming large in the future. The United States furnished, by far, the bulk of the scrap. Crude petroleum came chiefly from the Middle East; special lubricants and high-grade coking coal came mostly from the United States. Nonferrous metals came chiefly from Zambia, Canada, Australia, Chile, and Peru.

Japan's principal mineral exports during 1967 included iron and steel semimanufactures, nonmetallic mineral manufactures, and nonferrous metals that were valued at $1,272 million, $297 million, and $106 million, respectively. The United States was a major customer, especially of iron and steel semimanufactures, of which it took nearly one-half.

The following tabulations summarizes the Japanese mineral and total trade for 1966 and 1967:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1966	1,815	9,776	18.6
1967	1,792	10,442	17.2
Imports:			
1966	3,791	9,523	39.8
1967	5,129	11,663	44.0
Trade balance:			
1966	−1,976	+253	XX
1967	−3,337	−1,221	XX

XX Not applicable.

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Table 2.—Japan: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	1967	Principal destinations, 1966
Metals:				
Aluminum:				
Alumina	95,038	109,691	75,954	United States 59,439; Australia 37,995; Italy 9,450.
Aluminum hydroxide	7,104	11,208	13,046	Thailand 4,383; Australia 2,570; Singapore 2,370; Malaysia 1,065.
Metal and alloys:				
Unwrought	29,168	19,273	1,938	United States 11,350.
Semimanufactures	25,221	31,123	19,552	United States 17,010; Hong Kong 2,196.
Bismuth and alloys, all forms	197	91	230	Netherlands 34; France 29.
Cadmium and alloys, all forms	716	659	565	United States 253; United Kingdom 122; Netherlands 116.
Copper semimanufactures	50,440	39,744	33,635	United States 16,129; Taiwan 6,072; Philippines 4,315.
Iron and steel:				
Ferroalloys:				
Ferrochrome	23,733	22,256	6,328	United States 13,996; United Kingdom 4,389; Australia 1,176.
Ferromanganese	15,314	15,046	4,812	United States 9,566; United Kingdom 1,983.
Ferrosilicomanganese	723	598	348	Australia 185; United States 159; Ryukyu 135.
Ferrovanadium	311	80	42	All to North Korea.
Other	1,818	1,907	3,384	United States 1,061.
Primary forms:				
Ingots, thousand tons	39	6	9	All to Ryukyu.
Blooms, billets, and slabs, do	419	159	43	South Korea 55; Argentina 37; Philippines 27.
Coils for rerolling, do	889	860	758	United States 571; Spain 73; Italy 72.
Semimanufactures:				
Wire rod, do	742	741	659	United States 544.
Bars and other rods, do	757	550	988	United States 199; Thailand 101.
Large sections, do	397	337	269	United States 164.
Small sections, do	323	207	109	United States 146.
Plates and sheets:				
Heavy, including universals, do	926	854	763	United States 371; mainland China 106.
Medium, do	227	373	409	United States 220; mainland China 61.
Thin, uncoated, do	1,889	2,274	2,557	United States 923; Philippines 181; mainland China 163.
Tinplate, do	356	397	407	United States 82; mainland China 58; Taiwan 37.
Other coated, do	571	524	632	United States 290.
Hoop and strip, do	166	188	437	United States 46; Thailand 32; Singapore 18.
Rails and accessories, do	170	156	56	South Korea 35; Thailand 23; Mexico 17.
Wire, do	393	377	844	United States 216; Thailand 49.
Pipes, tubes, and fittings:				
Cast pipes and tubes, do	10	19	20	Taiwan 4; Singapore 3; Hong Kong 2; Philippines 2.
Seamless pipes and tubes, do	401	504	462	Mainland China 148; U.S.S.R. 140; United States 62.
Other pipes and tubes, do	869	820	850	United States 523; Saudi Arabia 39; mainland China 34.
Fittings, do	145	124	58	United States 59; Canada 20.
Castings and forgings, do	1	1	1	All to United States.
Lead:				
Metal and alloys, unwrought and semimanufactures.	11,535	9,997	7,978	South Korea 2,067; Ryukyu 2,056; United States 1,812.
Magnesium metal and alloys, all forms	107	122	74	North Korea 96.
Manganese:				
Oxides	18,939	21,347	24,384	Taiwan 1,670; West Germany 1,633; United Kingdom 1,546.

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Mercury 76-pound flasks	2,610	1,576	864	South Korea 806; Canada 299.
Molybdenum metal and alloys, all forms	25	70	129	Australia 61.
Nickel:				
Metal and alloys, unwrought and semimanufactures.	384	3,108	1,891	Thailand 2,795.
Platinum group metals and alloys, all forms. thousand troy ounces	6	6	26	United States 2; mainland China 2.
Selenium	31	42	48	United Kingdom 30.
Silver and alloys, unwrought and semimanufactures. thousand troy ounces	154	99	164	Taiwan 36; South Korea 32; India 16.
Titanium:				
Oxides:				
Rutile type	21,129	18,145	14,461	United States 3,908; Belgium 1,883; Sweden 1,760; mainland China 1,494.
Other	16,984	19,600	13,284	United States 11,335; mainland China 2,030.
Metal including alloys, all forms	3,536	4,936	4,982	United States 4,054.
Tungsten:				
Metal and alloys, all forms	106	86	29	India 42; mainland China 33.
Zinc:				
Metal and alloys:				
Unwrought	55,404	59,147	65,751	United States 18,330; Philippines 11,921; Taiwan 4,603.
Semimanufactures	1,071	2,195	3,461	United States 351; Taiwan 303; Philippines 194; Hong Kong 181.
Nonmetals:				
Cement thousand tons	1,601	1,619	2,076	Ryukyu 300; Thailand 229; Singapore 205.
Chalk	8,470	9,203	7,547	Hong Kong 2,491; Singapore 2,429; Malaya 1,411.
Clays and clay products:				
Crude, clay	46,534	36,498	42,447	Philippines 12,522; Taiwan 8,665; Salvador 5,988.
Diamond:				
Industrial thousand carats	110	361	482	United States 159; United Kingdom 138.
Gem, not set or strung do	676	587	648	Netherlands 543; United States 42.
Diatomite and other infusorial earths	443	436	657	Malaysia 214; Philippines 47; Thailand 46.
Dolomite, crude and calcined	2,277	42,358	3,625	Philippines 42,068.
Fertilizer materials:				
Ammonium chloride	210,091	306,944	385,888	Mainland China 241,750; South Korea 20,596.
Ammonium sulfate	1,283,777	1,205,089	1,628,861	Mainland China 553,600; Taiwan 202,500; South Korea 192,780.
Urea	2,053	30,636	64,183	Philippines 17,952; South Viet-Nam 5,009; Mexico 5,000.
Other	400,481	252,455	227,107	Mainland China 116,601; Thailand 38,520.
Total	1,896,402	1,795,124	2,306,039	
Gems, including industrial precious and semiprecious stones, not elsewhere specified:				
Dust and powder, including diamond dust. thousand carats	25	73	2,771	United States 36; United Kingdom 19; South Korea 10.
Other, excluding diamond and including piezoelectric quartz. kilograms	10,324	8,695	14,735	United States 4,274; Hong Kong 1,919; South Korea 1,080.
Graphite	700	677	715	Thailand 534.
Gypsum and plasters	7,335	13,924	10,846	Singapore 6,484; Philippines 6,418.
Iodine	1,396	2,366	2,123	United States 1,279; France 286.
Limestone, excluding dimension stone. thousand tons	423	513	369	Australia 270; Hong Kong 239.
Lime	6,255	6,110	5,263	Singapore 3,263; Hong Kong 1,440; Ryukyu 1,049.
Magnesite	10,895	46,537	17,174	United States 31,666.
Mica, all forms	82	172	102	South Korea 141.
Phosphorus, red	344	546	570	United States 239; India 190.

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Table 2.—Japan: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	1967	Principal destinations, 1966
Nonmetals—Continued				
Pigments, mineral, iron oxides and hydroxides	333	389	491	Taiwan 313.
Sodium and potassium hydroxides and peroxides	55,142	76,718	84,075	U.S.S.R. 29,713; South Korea 13,767.
Oxides, hydroxides and peroxides of magnesium, strontium or barium.	13,260	23,836	18,915	United States 15,455; Australia 5,152.
Stone, sand and gravel:				
Gravel and crushed stone	1,063	1,194	1,841	Ryukyu 616; United States 183; Taiwan 170.
Quartz and quartzite	371	207	77	Thailand 125.
Sand, excluding metal-bearing	1,969	1,467	1,473	Philippines 1,320.
Sulfur:				
Elemental, all forms	191	5,492	1,745	South Korea 4,430; Taiwan 1,027.
Sulfuric acid	634	1,169	1,162	Indonesia 456; Cambodia 237; Hong Kong 217.
Talc, soapstone, and steatite	4,836	999	764	Philippines 480; Thailand 236.
Mineral fuels:				
Coal, coke, and briquets:				
Coal—thousand tons	67	33	59	All to South Korea.
Coke	29	58	46	South Korea 31; New Caledonia 14.
Carbon black	9,675	9,519	12,984	Mainland China 1,964; Taiwan 1,926.
Petroleum:				
Refinery products:				
Gasoline—thousand 42-gallon barrels	2,169	2,022	2,260	Ryukyu 1,203; Philippines 216.
Petroleum spirits (nonfuel use)—do	1,164	1,104	534	United States 973.
Kerosine—do	1,407	2,314	2,380	Ryukyu 868; Hong Kong 616; Philippines 388.
Distillate fuel oil—do	1,328	1,447	1,300	Hong Kong 662; Philippines 244.
Residual fuel oil—do	106	417	1,013	South Korea 247; Hong Kong 110.
Lubricating oils—do	544	1,579	603	Taiwan 648; South Korea 552.
Cutting and insulating oils—do	371	399	119	Taiwan 270.
Other oils—do	---	---	---	
Liquid paraffin—do	---	---	---	
Greases	4,759	7,780	6,164	France 4,955.
Jelly and wax	12,999	18,666	14,693	Brazil 5,642; Republic of South Africa 2,609; Philippines 2,041.
Pitch and asphalt	118,286	75,434	111,025	South Korea 18,978; Ryukyu 6,952; Hong Kong 4,613.
Petroleum coke	---	---	25	NA.
Unfinished oils—thousand 42-gallon barrels	46	49	13	All to South Korea.

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Table 3.—Japan: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity		1965	1966	1967	Principal sources, 1966
Metals:					
Aluminum:					
Bauxite and concentrates of aluminum.	thousand tons	1,675	1,822	2,086	Malaysia 629; Indonesia 604; Australia 533.
Alumina, all forms		54,747	99,077	119,816	Australia 92,205.
Metals and alloys:					
Scrap		9,376	19,094	20,845	United States 12,307.
Unwrought		42,310	77,001	165,177	Canada 31,317; U.S.S.R. 19,671; United States 14,700.
Antimony, ore and concentrate		4,545	7,403	9,070	Bolivia 4,283; mainland China 1,610; Republic of South Africa 980.
Arsenic, oxides and acids		2,567	2,787	2,044	France 1,650; Sweden 905; U.S.S.R. 232.
Chromium:					
Chromite [1]		360,299	421,873	595,693	U.S.S.R. 145,814; Philippines 112,383; Republic of South Africa 67,369.
Copper:					
Ore, concentrate and matte		618,621	717,229	1,047,071	Philippines 288,970; Canada 229,492.
Metal and alloys:					
Scrap		64,949	66,883	77,114	United States 30,141; Hong Kong 5,171.
Ingot		115,038	149,665	269,995	Zambia 88,871; United States 23,007.
Iron and steel:					
Iron ore, including roasted pyrite.	thousand tons	39,018	46,095	56,696	India 10,195; Chile 7,629; Malaysia 5,793, Peru 5,063.
Scrap [2]	do	3,363	3,534	6,708	United States 2,669.
Pig iron and ferroalloys	do	2,640	2,886	6,558	U.S.S.R. 1,024; mainland China 520; Republic of South Africa 454.
Lead:					
Ore and concentrate		67,247	81,033	130,127	Canada 30,904; Australia 23,151; Peru 12,184.
Metal, all forms		41,262	23,281	20,794	Australia 6,745; Peru 4,674; Republic of South Africa 4,095.
Magnesium, unwrought and semimanufactures		569	1,047	841	Norway 720; United States 312.
Manganese ore and concentrate [3]		1,064,839	1,140,366	1,506,772	India 420,708; Australia 131,844; Republic of South Africa 120,480.
Mercury	76-pound flasks	2,747	22,954	32,083	Spain 9,004; Italy 6,054; Mexico 3,102.
Molybdenum:					
Ore and concentrate		5,032	7,336	8,787	Canada 2,842; United States 2,577.
Nickel:					
Ore and concentrate (low-grade)		966,742	1,269,943	1,660,742	New Caledonia 1,114,333; Indonesia 133,653.
Matte		4,357	5,048	9,619	New Caledonia 4,794.
Metal and alloy products		3,314	3,722	14,332	Canada 1,877; Norway 868.
Palladium	thousand troy ounces	261	380	335	U.S.S.R. 289; United Kingdom 57.
Platinum	do	181	185	234	U.S.S.R. 89; United Kingdom 59.
Silver	do	4,789	7,032	10,170	United States 5,133; Peru 1,139; North Korea 374.
Tin:					
Ore and concentrate	long tons	762	1,687	594	Thailand 1,569; Australia 117.
Metals and alloys, unwrought and semimanufactures	do	14,621	16,839	19,306	Malaysia 15,771.
Titanium:					
Ore and concentrate		211,949	324,952	273,609	Australia 174,117; Malaysia 85,509; Ceylon 38,100.
Slag		32,676	30,309	5,356	All from Canada.
Tungsten:					
Concentrate		1,501	2,753	4,507	South Korea 957; mainland China 445; Portugal 283.

See footnotes at end of table.

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Table 3.—Japan: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	1967	Principal sources, 1966
Metals—Continued				
Zinc:				
Ore and concentrate	380,332	446,112	614,079	Peru 241,413; Australia 46,491; Canada 42,416.
Metal, including alloys, unwrought and manufactures	7,129	7,650	18,111	North Korea 4,490; Australia 1,284.
Nonmetals:				
Abrasives, natural, crude, except diamond	2,172	2,692	4,225	United States 2,292.
Asbestos	133,522	237,334	188,741	South Africa 128,688; Canada 70,781.
Barite	14,310	39,171	33,793	Mainland China 37,230.
Boron materials:				
Crude natural borates	4,452	5,751	8,342	Turkey 4,025; United States 1,726.
Boric oxides and acids	6,235	8,157	8,003	United States 7,996.
Clay and clay products:				
Kaolin	60,068	80,195	103,927	United States 43,364; South Korea 27,185.
Other crude clay	111,228	95,674	97,641	United States 53,673; South Africa 37,374.
Cryolite and chiolite	6,334	4,961	9,005	Denmark 4,715.
Diamond:				
Industrial—thousand carats	r 2,186	2,819	3,611	United Kingdom 915; United States 887; Congo (Kinshasa) 320.
Other, not set or strung—do	330	281	512	Belgium 77; Israel 60; Switzerland 41.
Fertilizer materials:				
Phosphate rock—thousand tons	2,418	2,559	2,632	United States 1,753; Morocco 327; Senegal 204.
Potassium chloride—do	977	1,086	1,192	Canada 441; United States 338; U.S.S.R. 158.
Potassium sulfate—do	87	83	58	France 48; West Germany 15; Italy 12.
Fluorspar	171,561	224,252	358,875	Mainland China 97,330; Thailand 63,158; South Korea 37,249.
Graphite:				
Crystalline and special amorphous	6,195	6,253	7,616	South Korea 2,112; Ceylon 1,853; West Germany 1,072.
Amorphous	46,067	46,489	47,581	South Korea 41,327.
Gypsum and plasters	50,332	49,083	43,961	United Arab Republic 32,856; Morocco 15,846.
Magnesite, including magnesia clinker	26,171	24,137	34,997	North Korea 14,225; U.S.S.R. 4,391; mainland China 3,563.
Mica, crude and partly worked	6,612	4,517	7,623	India 3,095.
Salt—thousand tons	3,543	3,832	4,432	Mexico 1,125; mainland China 906; India 356.
Stone, sand, and gravel:				
Quartz and quartzite	41,847	58,836	127,784	South Korea 52,332.
Sulfur and pyrite:				
Sulfur, all types	53,972	9,781	29	Canada 8,281.
Pyrite, unroasted	29,440	265,564	78,546	U.S.S.R. 202,209; Philippines 54,755; Canada 8,600.
Talc	25,094	34,595	47,825	South Korea 15,746; mainland China 7,425; U.S.S.R. 7,024.
Soapstone (natural steatite)	28,582	42,359	46,985	Mainland China 18,375; South Korea 11,970.
Mineral fuels:				
Asphalt and bitumen, natural, crude	3,269	2,872	3,153	All from United States.
Carbon black	2,075	2,179	3,083	United States 2,005.
Coal and coke:				
Anthracite coal—thousand tons	1,165	1,288	1,436	North Viet-Nam 361; mainland China 229; Republic of South Africa 208.
Heavy coking coal:				
With less than 8 percent ash—do	8,769	9,020	12,900	United States 6,940; Australia 1,833.

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With more than 8 percent ash	do	4,721	6,038	6,601	Australia 3,512; U.S.S.R. 1,140.
Other bituminous coal, mainly for coking.	do	2,475	3,792	4,530	Australia 2,709; U.S.S.R. 208.
Total	do	17,130	20,138	25,467	
Gas, natural and manufactured (liquefied)		503,160	818,228	1,209,217	Kuwait 504,913; Saudi Arabia 284,997.
Petroleum:					
Crude	thousand 42-gallon barrels	508,483	585,812	696,838	Iran 173,730; Kuwait 128,080; Saudi Arabia Neutral Zone 91,126; Saudi Arabia 90,686.
Refinery products:					
Gasoline	do	325	274	10	Singapore 114; India 99.
Petroleum spirits (nonfuel use)	do	3,789	7,475	10,502	Kuwait 3,435; Saudi Arabia 1,689.
Kerosine	do	202	245	324	United States 186.
Distillate fuel oil	do	220	15	928	Saudi Arabia 9, United States 2.
Residual fuel oil	do	86,366	77,336	88,694	Iran 11,670; Kuwait 10,378; Singapore 8,031.
Lubricating oils	do	2,023	2,435	3,713	United States 2,050.
Cutting and insulating oils	do	66	26	126	United States 25.
Other oils	do	1,663	3,301	355	U.S.S.R. 1,981; Venezuela 1,129.
Liquid paraffin	do	1,235	120	839	United States 114.
Greases		21,437	4,331	12,366	United States 3,471.
Jelly and wax		8,824	10,388	14,111	United States 9,198.
Pitch and asphalt		5,634	2,784	134	All from United States.
Petroleum coke		961,709	1,098,186	1,299,480	United States 896,626; mainland China 111,404.
Unfinished oils	thousand 42-gallon barrels	20,778	39,009	61,875	Saudi Arabia 18,743; Saudi Arabia Neutral Zone 8,950.

r Revised.
1 Includes both refractory and metallurgical chromite; that originating in the Philippines is refractory grade.
2 Includes only that scrap classified for smelting.
3 Includes ferruginous manganese ore.

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COMMODITY REVIEW

METALS

Aluminum.—As output increased 8 percent, Japan moved into fourth place among world primary aluminum producers in 1967, surpassing France. Bauxite imports, upon which Japan is heavily dependent for raw material, exceeded for the first time the 2-million-ton level (2,086,629 tons). Principal sources were Indonesia (37 percent); Australia (31 percent); and Malaysia (30 percent). Australia was also the origin of nearly all of the 119,816 tons of alumina imported. Rising domestic primary aluminum consumption, estimated at 510,000 tons, probably moved the country into third place internationally in that respect. So strong was demand for metal for fabrication that imports of unwrought aluminum and alloys were double those of 1966, reaching 165,177 tons valued at $81.9 million; Canada (53 percent) and the United States (25 percent) were the principal suppliers. Domestic use of rolled aluminum and rolled aluminum alloys totaled about 177,000 and 365,000 tons, respectively. Exports of aluminum semimanufactures brought in about $23.5 million.

All four producers of primary aluminum were constructing or planning additions in 1967. Nippon Light Metal Co., Ltd., with nearly 37 percent of total 1967 output, was planning a new plant at Tomakomai in Hokkaido. Scheduled to produce 40,000 tons per year starting in 1970, capacity would eventually reach 120,000 tons; a 120,000-per-year aluminum plant is to be added at the site later. Nippon Light Metal's other facilities and their annual capacities in 1967 included a 38,000-ton refinery at Niigata that was being expanded to 58,000 tons; a 109,000-ton refinery at Kambara; and a 305,000-ton alumina plant at Shimizu that was being raised to 360,000 tons.

Showa Denko K.K., which accounted for 24 percent of total primary aluminum output, announced expansion of its Chiba refinery from 61,000 to 80,000 tons annually; other company plants and their annual capacities were refineries at Kitakata (40,000 tons) and Omachi (18,000 tons) and a reduction plant at Yokohama (210,000 tons). Sumitomo Chemical Co., Ltd., producing 23 percent of the primary aluminum, brought on stream in 1967 at Niihama in Shikoku the first 17,000-ton-per-year section of a new refinery and continued construction to increase capacity to 34,000 tons. Other company facilities and their annual capacities were the 50,000-ton Nagoya refinery and a 50,000-ton aluminum plant and a 190,000-ton alumina plant both at Kikumoto. Mitsubishi Chemical Industries, Ltd., with 16 percent of national output coming from its single plant, was expanding its Naoetsu installation's annual capacity from 67,000 to 107,000 tons.

Vigorous protests by the existing companies were apparently unable to prevent the entry of a fifth producer into the industry in 1967. A group of five companies belonging to the Mitsui industrial combine evidently obtained tacit MITI permission to build a refinery at Omuta on Kyushu. Initial capacity is to be 30,000 tons annually in 1971, using Australian alumina as a raw material. Later, refining capacity will be doubled and an alumina processing facility added.

Chromium.—All of Japan's requirements for high-grade chromite were met by imports. In 1967, these imports, mostly metallurgical grade and destined for conversion to ferrochrome, were about 600,000 metric tons valued at approximately $17.6 million. Three countries furnished 80 percent of the imports; South Africa (which more than doubled the 1966 shipments), the Soviet Union, and the Philippines.

Nippon Steel Tube Co., Ltd., reportedly developed a new vacuum process for making low-carbon ferrochrome and started to construct a plant of this type with completion set for 1969. Nippon Ferro Alloy Co., a recent merger of Tekkosha Co. and Toshiba Denko K.K., also plans to utilize Nippon Steel's new process.

Copper.—Demand for copper continued to rise rapidly in 1967 in spite of a 3-year stagnation in the copper wire industry, which consumes about two-thirds of the new refined copper supply. Domestic ingot production jumped about 19 percent to a new high, nevertheless ingot imports reached a record 270,000 tons valued at about $281 million. Zambia supplied about one-third of these imports, becoming Japan's largest supplier.

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The domestic mining industry, still in the initial stages of developing the complex nonferrous "kuroku" ore of northern Honshu (reserves of which reached 66 million tons of 2.5 percent copper in 1967), produced a record amount of copper during the year, but met only a small part of the needs of refiners who consumed approximately 107,000 tons of indigenously produced copper, 289,000 tons of foreign copper ores, and 74,000 tons of copper in scrap and other raw materials. Copper concentrate imports in 1967 totaled 1,022,155 tons, valued at $223.1 million.

To obtain the increasing amounts of foreign copper ore necessary to sustain protracted growth, Japanese copper companies continued their aggressive search for raw materials in 1967. The most important new development was in Malaysia where OMRDC outbid seven other international competitors to obtain mining rights to the Mamut copper property of Sabah. In the Congo (Kinshasa) a joint Congo - Government - Japanese Company, Congo Mine Development Co. (SODIMIKO) was in the process of formation to develop 36,000 square kilometers of copper concession areas.

In the Philippines, which provided 40 percent of the imported copper ore in 1967, Nippon Mining was on the verge of an agreement to buy the entire 4,000-ton-per-year copper metal output of the new Marinduque Island mine of Marcopper Mining Corp. for a 10-year period beginning 1970. In Canada, the source of 33 percent of 1967 concentrate imports, some 15 Japanese companies were actively engaged in developing new copper prospects or extending previous commitments. The most significant agreement reached in 1967 involved a $7.5 million loan by Nippon Mining and Mitsui Mining and Smelting Co., Ltd., to Noranda Mines Ltd. to assist in developing the Branda mine in British Columbia. The Japanese companies were to receive the entire copper output, estimated at 16,000 to 18,000 tons annually, for 5 years beginning in 1969. Negotiations with the Soviet Union over the development of the huge Udokan copper deposit in eastern Siberia apparently reached an impasse in October when the Japanese rejected as excessive Soviet estimates of the Japanese investment required.

Mitsubishi Metal Mining Co. Ltd. was the leading copper refiner. Their Naoshima smelter in 1966 became the first Japanese copper processing installation to exceed the 100,000-ton-per-year mark. Their majority-owned subsidiary Onahama Smelting and Refining Co. in 1967 was in the process of expanding its smelter-refinery capacity from 60,000 to 120,000 tons. Mitsubishi itself announced its intention to build an 84,000-ton smelter-refinery at Naoshima. Other producers, roughly in order of output were Nippon Mining; Sumitomo Metal Mining Co., Ltd., Mitsui Smelting; Dowa Mining Co., Ltd., Furukawa Electric Industry Co., Ltd., and Toho Zinc, Ltd.

Facilities of the Japanese copper smelting and refining industry, ranking fifth globally in terms of refined output, in 1967 were believed to be approximately as follows:

Company	Facility	Annual capacity (thousand metric tons)	
		Smelting	Refining
Dowa Mining	Kosaka	25	25
	Okayama	10	10
Furukawa Electric	Ashio	35	----
	Nikko	----	35
Mitsubishi Metal	Naoshima	110	----
	Osaka	----	70
	Osarizawa	20	----
Mitsui Smelting	Hibi	40	----
	Takehara	----	60
Nippon Mining	Hitachi	55	55
Onahama Smelting	Onahama	70	70
Sumitomo Metal	Kunitomi	15	----
	Niihama	----	70
	Shisakajima	50	----
Toho Zinc	Annaka	10	10
Total		440	405

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Ferroalloys.—Japan produced a record tonnage of 757,000 tons of ferroalloys in 1967, 168,000 tons more than in 1966. Significant advances were made in almost all products, with ferronickel and ferrotungsten outputs nearly doubling the 1966 levels. A large portion of the ferroalloy raw materials had to be imported, as in previous years. In recent years, the bulk of the ferroalloys produced has been consumed by the Japanese steel industry. Exports in 1967 were only 2 percent of output, as compared with 6 percent in 1966.

Throughout 1966 and 1967 mergers among the approximately 35 firms engaged in making ferroalloys continued at an accelerating pace. This was in accordance with a 1963 decision of the Japan Ferroalloy Association calling for these mergers as an essential step in replacing Japan's somewhat obsolete ferroalloy-producing facilities with more efficient and larger installations. MITI indicated preference for mergers instead of market cartels which have hitherto attempted to regulate the volatile ferroalloy market. The largest of the mergers, joining together three producers loosely affiliated with Yawata Iron and Steel Co., Ltd., will probably control about one-fourth of the market when completed in 1968. Fuji Iron and Steel Co., Ltd., and Kawasaki Steel Corp. reportedly completed mergers of their three and five affiliates, respectively, in 1967 into companies sharing 10 to 15 percent of the market each. The largest single manufacturer of ferroalloys, however, was still believed to be Nippon Steel Tube Co., Ltd.

Gold.—Despite rising refined gold production, about half of which is obtained as a byproduct of imported nonferrous base metal ore smelting, demand for nonmonetary purposes has far outstripped supply. In 1967, for the first time since World War II, the Japanese Government imported gold bullion for distribution to commercial users; an estimated 260,000 troy ounces was brought abroad for this purpose. Gold recovered by remelting old metal and probably some acquired through smuggling also contributed to supply.

About 70 percent of Japan's 253,000-troy-ounce gold output in 1967 was from 42 precious metal mines; the remainder was a byproduct from copper, lead, and zinc ores. The prospect of a higher international price for gold galvanized most of the major precious metal mining companies into renewed exploration of their properties. In February Taio Mining Co. claimed to have uncovered a new 1.2-million-ton reserve of 0.0014 percent gold ore at its Fukii mine in Kagoshima Prefecture and in December Sumitomo Metal confirmed the finding of an additional 500,000 tons of ore grading up to 0.004 percent gold at its Kohnomai mine in Hokkaido, still by far Japan's largest precious metal mine.

Refinery gold output totaled 678,000 troy ounces in 1967. Approximately 272,000 troy ounces was from indigenously produced gold ores, 344,000 troy ounces from foreign ores, and 62,000 troy ounces was reclaimed from scrap and other raw materials.

Iron and Steel.—Japan's crude steel output reached a new high of 62.2 million metric tons in 1967, 30 percent more than in 1966, ranking the country a strong third among world steelmakers, behind the United States and the U.S.S.R. On a per capita basis it was roughly on a par with West Germany and the United States. Steel was in oversupply for Japan during 1967 because domestic and international market demand did not come up to expectations. Japanese Government and industry officials felt that the oversupply situation was temporary.

Production.—Streamlined but traditional blast furnaces accounted for more than 98 percent of Japan's 1967 production of 40.1 million tons of pig iron. Of the methods employed in producing crude steel during the year, the basic oxygen furnace (BOF) accounted for 41.8 million tons; the electric furnace, 11.4 million tons; and the open hearth furnace (OH), only 9.0 million tons. BOF steel had been steadily gaining ground at the expense of OH steel. In 1960 only 2.6 million tons of BOF steel was produced and in 1963, 12 million tons. Japan had been the world's largest BOF steel producer for more than 5 years. Japan's steel product output was correspondingly high in 1967—45.9 million tons of hot-rolled ordinary steel and 4.4 million tons of hot-rolled special steels. Detailed statistics on Japan's iron and steel production are available in various publications of the Japan Iron & Steel Federation.

Japanese Government and industry officials do not view the current steel capacity

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as being excessive, believing that continued expansion of the domestic economy in the immediate years ahead will not only absorb but will outpace existing capabilities. No Japanese officials have suggested that the country solve oversupply problems by dumping the commodity in the world markets. They have often stated that they will expand the industry with due consideration for the maintenance of orderly world markets.

Consumption.—The domestic market consumed about 80 percent of Japan's 1967 steel output. The Government was a particularly large consumer because of programs to improve public facilities such as roads, sewage and transport systems, land reclamation projects, and public buildings. Government and private sector spending made construction the foremost steel consumption category with about 25 percent of the total. Shipbuilding ranked next with more than 10 percent of the total followed by automobiles with just under 10 percent, and heavy machinery with approximately 4 percent. Japan's rapidly expanding automobile industry, already rivaling that of West Germany, will have an inceasing impact on the steel industry.

Trade.—During 1967 Japan's steel industry depended upon foreign sources for nearly 90 percent of its iron ore, more than 70 percent of coking coal, and about 25 percent of steel scrap. Iron ore imports in 1967 totaled 56.6 million metric tons, with India (10.8 million), Chile (8.3 million), Peru (6.8 million), Malaysia (5.2 million), and the United States (3.6 million) heading the list of sources. Coking coal imports totaled 24 million tons with the United States (10 million) leading Australia (9 million) slightly. About three-fourths of the scrap came from the United States. Plans underway showed that ore will outpace scrap even more in the future and that Australia will become most significant as a future iron ore supplier. Dollarwise, Japan's 1967 imports of iron and steel making materials totaled about $1,798 million, with iron ore at $718 million, coal at $401 million, pig iron and other steelmaking materials (except scrap) at $369 million, and steel scrap $310 million.

During the year Japan exported 9.1 million tons of primary iron and steel products valued at $1,272 million. Of this amount, 4.4 million tons were shipped to the United States, by far, Japan's chief customer for these commodities.

Financial.—The merger plan between Yawata Iron and Steel Co. and Fuji Iron and Steel Co. which was in process in 1967, was first made public in April 1968. Presidents of the companies made official announcements on May 1, 1968 revealing that the firms will not formally merge until mid-1969. This merger will result in the world's second largest private steel manufacturer, outranked only by the U.S. Steel Corp. Both firms were the result of the dissolution of the old Japan Iron and Steel Co. in 1950 by the Law of Deconcentration of Excessive Economic Power. Yawata is presently capitalized at $353.8 million and Fuji at $283.3 million. Yawata's 1967 crude steel output was 11.6 million tons and that of Fuji was 10.6 million tons.

Structure.—As of yearend 1967, Japan's iron and steel industry was characterized by increasing concentration in the eastern Pacific coastal ports of central and southern Honshu. The three most important steel complexes continued to be northern Kyushu, the Kobe-Osaka region of southern Honshu, and the Tokyo-Chiba region of central Honshu.

There were nine integrated steel firms[7] among the roughly hundred producers large and small. Six firms dominated the industry, accounting for roughly 90 percent of the pig iron production and 70 percent of Japan's crude steel and rolled products. The remaining three integrated firms produced the rest of the pig iron, about 11 percent of the crude steel, and 9 percent of the rolled steel.

The six dominant firms, which include five of the 15 largest steel producers in the world, are in the order of their relative size: Yawata Iron and Steel Co., Ltd.; Fuji Iron and Steel Co., Ltd.; Nippon Kokan Kabushiki Kaisha (Nippon Steel Tube Company, Ltd.); Sumitomo Metals Industries, Ltd.; Kawasaki Steel Corp.; and Kobe Steel Works, Ltd. At yearend 1967, these firms owned 21 of the country's 24 existing or projected integrated plants. Nakayama Steel Works Ltd., Nisshin Steel Works Company, Ltd., and Osaka Steel Manufacturing Company, Ltd., the three small ones, have single integrated plants

[7] A tenth integrated steel company, Tokai Iron & Steel Co., Ltd., was absorbed into Fuji Steel in 1967.

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each at Funamachi, Kure, and Nishijima, respectively.

At yearend 1967 the Chiba plant of Kawasaki Steel (6.0 million tons of crude steel annually) and the Wakayama plant of Sumitomo Steel (5.5 million tons) appeared to be the largest of the 20 operating integrated plants. Second-ranking plants, with capacities of roughly 4.0 million tons of steel annually, apparently were the Hirohata and Nagoya plants of Fuji Steel and the Sakai, Tobata, and Yawata plants of Yawata Steel. The remaining 11 plants were believed to have had capacities ranging down from the 3.4 million tons at the Muroran plant of Fuji Steel to the 0.4 million ton at the Nishijima plant of Osaka Steel. A number of additional steel plants were in various stages of planning and/or construction.

Major new facilities completed in 1967 include four blast furnaces with volumes ranging from 2,156 to 2,620 cubic meters, nine BOF's with volume ranging from 94 to 282 cubic meters, and 6 units of continuous steel coating equipment (three Olsson types).

Many Japanese blast furnaces have established world production records. The largest one designated as No. 2 blast furnace of the Sakai Works was blown in by Yawata Steel in mid-1967. This furnace, a ring-girder type, has a daily capacity of 5,700 tons, an inner volume of 2,620 cubic meters, a diameter of 11.2 meters, 30 tuyeres, 2 iron notches, and a 2-bell top charging device.[8] Before the Sakai No. 2 started operation, Sumitomo Steel's Wakayama No. 4 at 5,000 tons per day was the leader and Kawasaki Steel's Mizushima No. 1 at 4,500 to 5,000 tons was second. Fuji Steel's Nagoya No. 2 blast furnace was blown in in June 1967; this furnace has an inner-volume capacity 10 cubic meters bigger than that of Mizushima No. 1. Fuji Steel was scheduled to adopt the Soviet ultra-high pressure technique for its Nagoya No. 3 blast furnace rated at 2,700 cubic meters plus.[9] With these additions the number of operating blast furnaces in Japan at yearend 1967 stood at 54 units.

The story was the same for oxygen converters that were built in conjunction with blast furnaces. Japan's BOF's numbered 60 units at yearend 1967. Additions of three BOF's were made by Fuji Steel; and Kawasaki Steel, Sumitomo Steel, and Yawata Steel had two additions each. Largest ones constructed were Wakayama No. 3 (282 cubic meters) of Sumitomo Metal, Sakai No. 3 (275 cubic meters) of Yawata Steel, and Nagoya No. 3 (250 cubic meters) of Fuji Steel.

Estimated percentage production shares of the country's major steel producers for the Japanese fiscal years 1966 and 1967 (April 1 through March 31) are given in the following tabulation:

Firm	Percent of national output					
	Pig iron		Crude steel		Hot-rolled ordinary steel	
	1966	1967	1966	1967	1966	1967
Yawata Steel	24.2	23.1	18.8	18.6	20.2	19.5
Fuji Steel	23.3	22.1	17.4	17.2	17.8	17.6
Nippon Steel Tube	14.1	15.4	10.7	11.4	10.0	12.2
Sumitomo Steel	12.3	12.8	10.3	11.4	9.5	10.6
Kawasaki Steel	12.3	12.4	10.7	11.4	11.5	12.1
Kobe Steel	6.2	8.0	5.6	5.4	4.2	3.9
Nisshin Steel	3.4	3.7	2.9	3.2	2.8	3.1
Nakayama Steel	1.8	1.3	1.8	1.6	1.9	1.4
Others	2.4	1.2	21.8	19.8	22.1	19.6

Source: Japan Metal Bulletin. No. 2339 May 2, 1968, p. 2.

[8] Japan Iron and Steel Monthly. World's Largest Blast Furnace Kindled at Sakai Works. No. 151, August 1967, p. 15.

[9] Japan Iron and Steel Monthly. Fuji to Induct Russian Techniques. No. 149, June 1967, p. 15.

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The Japanese steel industry undoubtedly will continue to expand in the next few years. Early plans by the major steel producers called for capacity increases much beyond that necessary for supporting the estimated demand of 72 million tons of crude steel made by MITI for fiscal year 1971 (April 1971 to March 1972). In early 1968, the steel producers were urged by the Government through the Facilities Adjustment Council organized by the Japan Iron and Steel Federation to voluntarily lower their sights on production and investments in new facilities. In fact, it was suggested by MITI that investments in fiscal year 1968 be reduced from $1.22 billion originally planned to $1.1 billion which still would be a 10-percent increase over the actual investments during fiscal year 1967. Thus, a temporary slowdown in expansion was imminent, although capacity increases will still be substantial.

Technology.—During 1967 no phase of Japan's steel industry was without technological improvement. Parallel with the increased use of larger ore carriers was the installation of additional belt conveyor systems to bring ore directly to the blast furnaces. Sintered ore was utilized to a greater degree because of more efficient blast furnace smelting techniques such as moisture-added blasting, oxygen-enriched blasting, fuel injection, and high pressure operations. At yearend 1967 the number of blast furnaces operating under high pressure systems reached 16 or about one-third of Japan's total. During the year, furnaces were operated at a mean temperature of about 1,000° C and maximum of 1,350° C. Average pig ratio (daily iron production in metric tons per cubic meter of furnace volume) was slightly improved in 1967, from 1:1.52 recorded in 1966 to 1:1.6 in 1967. The 1967 coke ratio of 503 kilograms per ton of iron produced showed little improvement. In an attempt to reduce dependence on coke while raising output, heavy oil and coal fine slurry injection was introduced to Fuji Steel's No. 1 blast furnace at Muroran. Kobe Steel's No. 3 blast furnace, commissioned in 1966, registered an average sintered ore to total iron ore ratio of 64 to 65 percent with a maximum of 80 percent in 1967.

Basic oxygen furnace hourly production rate averaged 170 tons in 1967, approximately 3 tons more than the 1966 rate. Steelmaking time was reduced to 35 minutes per charge. With increased use of BOFs refractory brick consumption per ton of steel produced climbed from 4.0 kilograms in January to 4.8 kilograms in August. Molten iron continued at a level of 75 percent of total material charged in BOFs during 1967.

To compete with the BOFs further efforts were made to improve the efficiency of electric furnaces. Troidal burners were employed with the expectation of increasing electric furnace productivity by 30 percent. Seven continuous casting machines of different types were commissioned during 1967. Reportedly, Japan's steel industry was solving the problem of continuous casting of rimmed steel, a long-held problem in the field, through vacuum degassing and other techniques.

Enlargement in size and automation characterized the rolling division; computers and automated devices found greater use in bloom, slab, plate, and sheet mills. The industry's research program in 1967 emphasized development of non-tempered high-tensile-strength steel, weather-resistant steel, surface-treated steel, marine-water resistant steel, and very large H-shapes for extremely tall buildings and shock absorbing.[10] In this respect, a 36-story building is under construction in Tokyo employing steel developed by Yawata Steel. It has been reported that the design of the structure employing the shock-resistant steel will be able to withstand 5 times the stress of the strongest earthquake in the area.

Lead.—Domestic primary refined lead demand totaled approximately 162,000 tons in 1967. Most of this was met by Japanese refineries, which maintained their sixth-place ranking in world output by producing about 122,000 tons by electrolysis and 28,000 tons by the Parkes process.

As indigenous mine lead output was only marginally higher in 1967, the 26-percent rise in production was largely the result of importing a record 130,127 tons of lead concentrates valued at $20.2 million. The larger suppliers were Canada (48 percent), Australia (23 percent), and Peru (13 percent). Much of the apparently disproportionate rise in concentrate imports (60 percent) was the result of fuller operation of

[10] Japan Iron & Steel Monthly. Japan's Technological Developments in 1967. No. 159, April 1968, pp. 8–9.

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the new 36,000-ton-per-year-refinery of Mitsubishi Cominco Smelting Co. (Mitsubishi Cominco); this plant, first opened in 1966, relies almost entirely on Canadian dried lead ore. The leading primary refined lead producers in 1967 with their percentage of total output were: Toho Zinc (22); Mitsubishi Cominco (20); Nippon Mining (16); Mitsui Smelting (14); Mitsubishi Metal (14); and Sumitomo Metal (10). Together these refiners consumed about 59,000 tons of domestically produced lead ores, 67,000 tons of lead in foreign ores, and 24,000 tons of lead in scrap and other raw materials.

Magnesium.—Japan continued to be a significant world producer of primary magnesium, with an even greater output of secondary magnesium. An estimated two-thirds of the total 1967 production was consumed in the manufacture of titanium. Furukawa Magnesium Co., which uses dolomite and ferrosilicon as raw materials, was the principal primary magnesium producer (5,218 tons in 1967); it has a plant with a primary capacity of 5,000 tons and a remelt capacity of 3,500 tons. The only other manufacturer, Ube Chemical Industries Co., Ltd., using ferrosilicon and magnesium chloride derived from seawater as its raw materials and having a 1967 output of 1,530 tons, was expanding capacity to 5,000 tons. Secondary magnesium was recovered from magnesium chloride slag in 1967 by Toho Titanium Co., Ltd., at a plant at Chigasaki (3,514 tons) and Osaka Titanium Co., Ltd. (3,692 tons).

Manganese.—Japan continued to import large tonnages of high-grade manganese ore and ferruginous manganese ore—841,733 and 642,251 tons, respectively, in 1967. Australia and India were the leading suppliers. In 1967 Australia furnished 237,120 tons of regular manganese ore and 74,245 tons of ferruginous manganese ore, and India furnished 94,962 tons of the former and 378,586 tons of the latter. All told manganese ore imports cost Japan about $38.4 million in 1967. At yearend 1967, the Japanese were contracting 48 percent grade manganese ore at about $34 to $37 per metric ton c.i.f. Japan.

The bulk of the regular manganese ore was made into ferromanganese, whereas the ferruginous manganese ore was used in blast furnace smelting to help condition the linings. Japan also produced sizable tonnages of low-grade manganese ore and manganese oxide, and 5,000 to 6,000 tons of electrolytic manganese.

Molybdenum.—In mid-1967, Noranda Mines Ltd. of Canada and The Anaconda Copper Co. offered long-term supplies of molybdenum ore to Japan's ferroalloy manufacturers through Mitsui and Co. Details on the Noranda proposal are not known, but Mitsui indicated that Anaconda's offer was for 3,000 tons of concentrates annually over a 3-year period beginning late in 1969. Both companies were developing new mines. American Metal Climax, Japan's traditional supplier of molybdenum, also offered to increase sales to 3,500 tons per year. Japan's annual requirements of molybdenum metal has been about 7,500 tons.[11] Indigenous ores provided only 204 tons in 1967.

Nickel.—The world nickel shortages in 1967 forced the Japanese to search world markets for this raw material. In 1967 Japan imported some 5,000 tons of unwrought nickel from the U.S.S.R. valued at $20.1 million compared with only 12 tons valued at about $40,000 in 1966. With the relaxation of the import quota, nickel metal imports in 1967 more than tripled those of 1966. Japan imported more nickel from Canada during 1967 than in 1966. Prices paid, however, were high. In 1966 Japan paid about $0.98 and $1.46 for 1 pound of Canadian and Soviet nickel, respectively; and in 1967 $1.55 and $1.78 respectively.

Imports of nickel ore during 1967 increased approximately 400,000 tons or roughly one-third more than in 1966; New Caledonia provided about 90 percent of the 1967 total, but increasing tonnages are expected to come from Indonesia, Canada, and Australia. Value of nickel ore imports by Japan was $33.4 million in 1967, nearly $10 million more than in 1966. Most nickel ore was converted to ferronickel but 7,407 metric tons of nickel metal were also produced in 1967.

Late in 1967 announcement was made that a joint venture will be established shortly to include Nippon Yakin Kogyo Co. (36 percent); Société le Nickel of France (24 percent); Nippon Mining (24 percent); and Taiheiyo Nickel (16 per-

[11] Mining Journal. Molybdenum Offers to Japan. V. 268, No. 6873, May 12, 1967, p. 369.

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cent) to produce nickel oxide in Japan from New Caledonian matte. The new firm, Nippon Nickel Oxide Co., will have an annual production capacity of 5,000 tons of nickel oxide. Previously, Tokyo Nickel had been established as a joint venture comprised of Shimura Kako, Mitsui & Co., and International Nickel.[12]

Tin.—Mine tin output in Japan provided less than 6 percent of supply that totaled about 21,000 tons in 1967. Most imports came from the Japanese-owned Oriental Tin Smelting Company in Malaysia. To supplement Malaysian tin concentrate supplies, Oriental Tin concluded a contract in 1967 to purchase a few thousand tons of tin concentrates from Australia. Imports in 1967 were valued at nearly $70 million.

Titanium.—Japan's export-oriented titanium industry, one of the world's three largest, reportedly was undergoing expansion in 1967 despite difficulties in meeting competition from the Soviet Union. Osaka Titanium and Toho Titanium, which produce all of the sponge, were in the process of increasing their combined capacity from 9,600 to 12,000 tons annually. Somewhat over one-half of 1967 output, manufactured mainly from Australian rutile, was shipped to the United States. Kobe Steel, with a 7,800-ton plant, continued to be the major producer of ingots and mill products. Late in 1967 this company allegedly was considering a deal with the Soviet Union which would involve importing 900 tons of Soviet sponge. All titania slag was produced by Hokuetsu Electric Chemical Industrial Co. by smelting high-titania beach sands.

Tungsten.—The sharp increase in steel output called for expanded supplies of tungsten. Tungsten concentrate imports during 1967 rose to 4,507 metric tons valued at nearly $14 million. South Korea remained the leading supplier in 1967 with 1,432 tons followed by Bolivia, mainland China, Peru, and Thailand. Domestic concentrate output was equal to only 15 percent of imports in 1967. Awamura Mining, the only important ore producer in Japan, was also a leading ferrotungsten producer. Four firms were prominent in producing tungsten powder.

Uranium.—During 1967 Japanese interests were extremely active in seeking uranium supplies at home and abroad, mainly in anticipation of future needs in power generation, emphasized by the start-up late in 1967 of Japan's first commercial atomic powerplant—the 166,000-kilowatt Tokai Atomic Power Station. The principal developments overseas were in Canada where an agreement was reached in September between eight Japanese power companies and two Canadian mining companies (Denison Mines Ltd. and Rio Algom Mines Ltd.) for the delivery of roughly 14,000 tons of uranium oxide over a 10-year period beginning in 1969. In a smaller arrangement Tokyo Power Co. agreed to purchase 500 tons of uranium oxide from Eldorado Mining and Refining Ltd. over a 5–6-year period commencing in 1969. Other countries in which Japanese interests were investigating uranium potential in 1967 included Argentina, Australia, Brazil, Mexico, and the United States (Wyoming).

Domestically, two new important uranium discoveries were made which seemed to indicate that reserves of U_3O_8 were probably in the range of 5,000 to 10,000 tons. One find, a vein reportedly 7 meters thick and analyzing 0.24 percent U_3O_8, was uncovered in Yamaguchi Prefecture of southeastern Honshu, and a second find, a vein containing 0.04 percent U_3O_8 was discovered in Nagano Prefecture of central Honshu.

Zinc.—In 1967 Japan remained the world's sixth largest miner and third largest refiner of zinc. Domestic mine output rose only 3.5 percent, however, refined metal production, including about 311,000 tons by electrolysis, 148,000 tons by distillation, and 57,000 tons by zone refining, increased 16 percent. Although expanding domestic demand was mainly responsible for the jump in refined output, a record 65,751 tons of unwrought zinc valued at $18.4 million also was exported. The United States, the principal destination of Japanese zinc since large-scale shipments began in 1965, took 58 percent of 1967 exports.

The seven zinc refining companies in 1967 consumed in producing primary zinc metal about 247,000 tons of domestically produced zinc ores, 225,000 tons of zinc in imported ores, and 44,000 tons of zinc in scrap and other raw materials. Yearend refining capacity of these companies was estimated at 582,000 tons annually, divided

[12] Japan Metal Bulletin. Feb. 22, 1968, p. 3.

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as follows: Mitsui Smelting (178,000); Toho Zinc (132,000); Nippon Mining (102,000); Mitsubishi Metal (84,000); Sumiko Imperial Smelting Process Co., Ltd. (36,000); Nippon Soda Co., Ltd. (26,000); and Dowa Mining (24,000).

In anticipation of rising demand both at home and abroad, the four largest refining companies, including Toho Zinc whose 116,000-ton Annaka refinery is the largest single facility, were all planning capacity expansions. In addition, a new refining company, the Hachinohe Refining Co. Ltd. (a joint venture of Mitsui Smelting with five other zinc refining companies) was to bring on stream in northeastern Honshu in 1968 a plant with an annual capacity of 36,000 tons of zinc and 18,000 tons of lead. While specially designed to treat domestic "kuroku" ores, this plant, the second in Japan to employ the Imperial Smelting Process, will also process imported ores.

Imports of zinc concentrates reached another high in 1967 when 614,079 tons, valued at $48.6 million, were received. Peru accounted for almost one-half of the total. The most important new contract signed for zinc concentrates during the year, however, was with a Canadian mining concern, Anvil Mining Co. The six Japanese refiners signing the agreement are to receive 240,000 tons of 54 percent zinc concentrate and 130,000 tons of 69 percent lead concentrate annually for 8 years commencing 1969. This is twice the entire amount of both lead and zinc received from Canada in 1967. The price per ton was unofficially reported to amount to $150 for the zinc and $80 for the lead, c.i.f. Japan.

Other Metals.—Japan produces or consumes a great variety of other metals, many on a substantial scale. Because of its considerable nonferrous base metal smelting and refining capacity, the country ranks second in the world in the production of byproduct bismuth, third in cadmium and selenium, and probably about fourth in indium. It is a major consumer of antimony obtained in concentrates principally from Bolivia, mainland China, and the Republic of South Africa and of mercury acquired from Spain, Italy, and Mexico. Increasing amounts of high-purity metal products are produced, most notably, electronic-grade silicon and germanium.

NONMETALS

Cement.—Japan's 1967 cement output was 4.7 million tons above the 1966 level of 38.3 million tons. The country ranked third in world cement output behind the United States and the Soviet Union.

According to a recent Japanese Government survey, there were 21 cement producers in Japan operating 61 mills with a total annual capacity of 57.3 million tons. Production in 1967 was about three-fourths of capacity. There was a shortage of cement within Japan, and this caused sharp rises in prices. The strong domestic demand was brought about as a result of heavy construction activities by both the public and private sectors. The price increases hit the small construction companies particularly hard, as they were often forced to buy cement at twice the usual rates. Cement manufacturers blamed the shortages on a lack of special coastal ships and freight cars for transporting cement in bulk, labor shortages in limestone quarrying, inadequate trucking and port facilities, and strikes.

Exports of cement increased from 1.6 million tons in 1966 to 2.1 million tons in 1967. These exports went mostly to Southeast Asia where Japan was encountering stiff competition from Taiwan, mainland China, the Soviet Union, and local producers. Despite the domestic shortage the Japanese Government strongly urged producers to redouble their efforts to boost exports in order to retain existing outlets and as a countermeasure against sales campaigns of other countries.[13]

Fertilizer Materials.—Japan's fertilizer industry continued its steady expansion during 1967. Two major reasons have been advanced for this growth: (1) Looser controls on the industry by the Government and (2) a growing international market, particularly in Southeast Asia. Production of various fertilizer chemicals during fiscal years 1965 and 1966 was as follows:

Product	Thousand metric tons	
	1965	1966
Ammonia	2,294	2,495
Ammonium sulfate	2,606	2,584
Urea	1,255	1,559
Ammonium chloride	514	559
Calcium cyanamide	353	381

Source: Mitsui Trade News. Japan's Fertilizer Industry. V. 5, No. 4, April 1968, p. 1.

[13] K. Takita. Cement. Losing Interest. Far Eastern Economic Review. V. 56, No. 8, May 25, 1967, p. 462.

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Japan exported as much as 50 percent of its chemical fertilizers in recent years, chiefly to mainland China, Taiwan, South Korea, India, and South Viet-Nam.

Although fertilizer exports increased during 1966–67, prices dropped about one-sixth as compared with 1965 peaks. To cope with the declining prices and stiffer competition in foreign markets, the Japanese fertilizer industry was in the process of reorganization in 1967, with a view toward increasing productivity and reducing costs through building larger and more efficient plants. A significant development was the integration of Japanese fertilizer manufacturers into nine groups, as follows: Toyo Koatsu, Ube Industries, Mitsubishi Chemical Industries, Showa Denko, Sumitomo Chemical and Seitetsu Kagaku, Nihon Suiso and Tohoku Hiryo, Japan Gas-Chemical, Mitsubishi Petrochemical and Nitto Chemical, and Asahi Chemical Industry.

Plans have been drawn up by the Japan Ammonium Sulphate Industry Association (JASIA) to start construction of several 1,000-ton-per-day plants with an aggregate daily capacity of 9,150 tons. Completion of these plants was scheduled for 1972. Proposed sites include Osaka, Niigata, Ube, Onahama, Kashima, Matsuhama, and Mizushima.

Aside from sulfur (discussed in a subsequent paragraph), Japan continued to import most of the essential raw materials needed to make fertilizers. Phosphate rock was obtained from the United States, Morocco, and West Africa and potash from the United States, Europe, and the Soviet Union. Japan gets naphtha from imported crude petroleum. According to the Japanese, costly imports of raw materials place Japan in a disadvantageous competitive position. For example, phosphate rock purchased from the United States was nearly $19 per metric ton c.i.f. in 1967, of which half or more represented freight. The same can be said of potash.

Salt.—In 1967 more than four-fifths of Japan's salt requirement of 5.4 million tons had to be imported. Chief sources were Mexico and mainland China. However, production increased 14 percent during the year, reaching nearly 1 million tons. Approximately 80 percent of the indigenously produced salt was recovered by solar evaporation along the coast of the Seto Island Sea in the prefectures of Hyogo, Hiroshima, Okayama, Kagawa, and Ehime.

Japan's expanding alkali industry required increasing quantities of salt, and to meet this growing demand, major Japanese trading companies have taken a keen interest in developing salt resources located in western Australia. Seven firms were especially active in this field during 1967: Mitsui & Co.; Marubeni-Iida; Nissho Co.; C. Itoh & Co.; Toyo Menka Kaisha; Toshoku, Ltd.; and Sumitomo Shoji Kaisha. If plans materialize, Japan's annual salt imports from Australia may rise from 68,000 tons in 1967 to about several million tons by 1976.

Sulfur and Pyrites.—Japan continued to rank first among world producers of sulfur as contained in sulfide ores. Production in 1967 was approximately 2 million tons of contained sulfur, a slight decline as compared with what was produced in 1966. The bulk of the "pyritic" sulfur (mainly from pyrite and cupriferous pyrite) was converted to sulfuric acid and subsequently to sulfur-base fertilizers, an important part of which was ultimately exported. In the future, these exports may meet increasing sales resistance in various countries because of the construction of many urea and other nonsulfur-base fertilizer plants. Thus, the Japanese may eventually have to cope with the oversupply problem in "pyritic" sulfur.

Japan has also been a medium-rank producer of elemental sulfur. In the Japanese fiscal year 1967, approximately 343,000 tons were produced—280,000 tons from mines and about 83,000 tons from oil refineries. According to a MITI forecast,[14] sulfur from mines will stabilize at about 310,000 tons by 1970 whereas sulfur from oil refineries will climb to 507,000 tons in 1970 and 807,000 tons in 1975. Thus, Japan will soon become a country with large surplus of elemental sulfur—as much as half a million tons by 1970.

Other Nonmetals.—Japan's 1967 production of most nonmetallic minerals reached record highs. Notable gains were made by limestone, quick lime, dolomite, pyrophyllite, fire clay, silica sand, and stone. Production declines were registered

[14] Japan Petroleum Weekly. Jan. 29, 1968, pp. 4–6.

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by only a few items such as gypsum, barite, fluorspar, and graphite. All told about 300 firms were in the nonmetals business in Japan.

Limestone has been by far the most important nonmetallic mineral produced in Japan. Output increased roughly 50 percent during 1963–67, reaching 80.9 million tons valued at about $70 million as a direct result of heightened construction industry activity and rapid iron and steel industry expansion.

Among nonmetallic minerals not separately discussed, silica sand and stone ranked second to limestone in importance, with a total 1967 value of nearly $30 million. Pyropyllite was next in line, at about $20 million. Then came dolomite and gypsum at roughly $5 million each. Various clays, refractories, and fluxing materials were in the $1 to $3 million range in terms of 1967 output value. Other nonmetals were produced by small mines with limited reserves.

To support the rapidly growing industrial economy, Japan had to import many other nonmetallic minerals at great cost because local resources are limited or entirely lacking. Potash, phosphates, and salt have been previously mentioned. Other nonmetallic minerals imported in large quantities by world standards include asbestos, industrial diamond, fluorspar, graphite, mica, talc, and soapstone.

MINERAL FUELS

Coal and Lignite.—Despite substantial new subsidies initiated by the Government during 1967 the coal industry's financial situation declined drastically. The virtual assumption by the Government of $278 million of company indebtedness estimated at slightly over $600 million was offset by operating losses which mounted at a rate faster than the assumed debt payments could be made. Even companies and mines that had been singled out for special treatment under successive "scrap and build" programs failed to show improvement. By yearend a major reduction of production from the 50-million-ton level to about 35 million tons was being discussed, possibly with nationalization of the mines. The increasing inability of indigenously produced coal to compete in price with petroleum and foreign coal has been the immediate and principal factor behind the accelerated decline.

The financial deterioration of the coal industry was matched by an overall 7.5 percent decline in output. Bituminous steam coal fell 8 percent to 33,158,000 tons; bituminous coking coal 6 percent to 12,374,000 tons; anthracite 6 percent to 1,514,000 tons; and natural coke 18 percent to 436,000 tons. Operating mines decreased from 206 at the beginning to 165 at yearend, and the number of permanent workers, already in short supply, declined from about 102,000 to 89,000. Productivity rose far less than anticipated, from 40.2 to 41.8 tons per man per month.

Hokkaido, where geological conditions are more favorable for mining, produced the largest share of coal (46 percent) and had the highest productivity rate (46.1 tons). Kyushu accounted for 42 percent of total output, and Honshu for the remaining 12 percent. By far the most important field was Ishikari in Hokkaido which accounted for 35 percent of total output, 28 percent of steam coal, and 59 percent of coking coal. The 16 major companies that operate about 20 of the 30-odd mines having annual capacities of 500,000 tons or more continued to produce almost 70 percent of coal.

Spurred on by increasing steel industry demand for coke, coal imports, mostly bituminous coking coals, rose 26 percent to 25,467,000 tons valued at $401 million. Principal suppliers were the United States (40 percent) and Australia (35 percent). At yearend, however, negotiations were being conducted between Japanese interests and officials of the Kaiser Steel Corp. of the United States, owner of the substantial Balmer property in Canada, for the export of approximately 3 million tons of Canadian coal annually. Beginning about 1970, the contract would run for 15 years.

Total coal consumption in 1967 was 76.6 million tons, including 51.7 million tons indigenously produced and 24.9 million tons imported. The steel industry (40 percent) and public utility powerplants (33 percent) accounted for the greater part of use; the former consumed about 90 percent of foreign coal and the latter approximately one-half of the domestic coal.

The small lignite industry shared the decline of the coal sector: output declined 19 percent; the number of mines fell from 123 to 108; the number of permanent workers dropped to less than 2,000; and

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productivity declined to 17.9 tons per man per month.

Natural Gas.—In order to supplement stagnating supplies of domestically produced natural gas, two major arrangements were made in 1967 for importing liquefied natural gas (LNG). In March, Tokyo Gas Co. and Tokyo Power Co. agreed to annually import from 1969 through 1984 the equivalent of about 50 billion cubic feet of Alaskan gas from Phillips Petroleum Company and Marathon Oil Company, both of the United States. In December Teikoku Oil Co., Ltd., Japan's largest domestic natural gas producer, announced its intention to import through an intermediary the equivalent of approximately 70 billion cubic feet of gas annually from Brunei. The purchasing period is tentatively set at 20 years, beginning in 1970. Two tankers with capacities of 440,000 barrels of LNG each are under construction for transporting the Alaskan gas; an identical arrangement is apparently being considered for the Brunei gas.

Petroleum.—Demand continued to spiral in 1967, with domestic refined product consumption up about 22 percent to 749 million barrels. Crude oil imports, which also rose approximately 22 percent to 759 million barrels, continued to come from the Middle East. Despite some price increases resulting from the Arab-Israeli conflict, a record quantity, nearly 91 percent of crude supply, came from that area, as follows: Iran, 35.2 percent; Kuwait, 17.8 percent; Saudi Arabia, 17.7 percent; Kuwait-Saudi Arabia Neutral Zone (largely from the operations of the Japanese-owned Arabian Oil Company), 14.8 percent; and others, 5.2 percent.

While there was no quantitative disruption in Japanese supply, the Middle Eastern hostilities stimulated MITI into re-evaluating domestic storage facilities. In mid–1967 these consisted of about 63 million barrels of crude oil capacity, theoretically capable of supplying refineries with input for 33 days, and 101 million barrels of products, which could supply the market for 59 days. Actual inventories, however, were available only for 21 and 24 days, respectively. Consequently, MITI ordered the industry to increase storage capacity by 1970 to the point where actual inventories therein would always constitute a 35-day minimum supply of crude oil and a 60-day minimum of crude oil and products combined. Special loans and other financial assistance was arranged by MITI for this purpose.

In line with recommendations made in February by the Overall Energy Research Council, the Japan Petroleum Development Corporation (KODAN) was established in October to promote the development of crude oil sources overseas. More specifically, KODAN was to (1) provide Japan with oil supplies under her own control rather than under the control of foreign companies; (2) lessen dependence on Middle East oil by diversifying sources; (3) assure Japanese petroleum interests, now largely confined to refining and marketing activities, of the financial advantages to be obtained from production; and (4) improve the balance of payments situation by increasing the portion of crude oil obtained by yen. In addition to direct financial assistance to Japanese companies exploring overseas, KODAN is to guarantee private loans to these companies for the same purpose, lease equipment for geophysical exploration at home and abroad, offer technical advice on exploration and development, conduct geological surveys for the discovery of indigenous oil and gas, and train technical personnel. By the expenditure of about $166 million of both Government and industry funds during the next 3 to 6 years, the level of 1 million barrels per day of overseas Japanese-produced oil is to be reached.

At yearend 1967 Japanese interests held about 300,000 square kilometers of petroleum concessions in 10 areas around the world. Eleven companies were engaged in exploring for or producing oil in Abu Dhabi, Australia, Canada, Indonesia, Malaysia, New Guinea, the Kuwait-Saudi Arabia Neutral Zone and the United States (Alaska). The most important new concessions were obtained in Abu Dhabi in December by Maruzen Oil Co., Daikyo Oil Co., Ltd., and Nippon Mining.

Japanese crude refining capacity was estimated at 2,338,000 barrels per day at yearend 1967, a 5.7-percent increase over the previous year. Principal refinery increases during the year included an addition of 80,000 barrels to the 180,000-barrel-per-day Chiba refinery of Idemitsu Kosan Co., Ltd.; 30,000 barrels added to the 57,000-barrel Kawasaki refinery of

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Nichimo Oil Co., Ltd.; and a 14,000-barrel addition to the 48,000-barrel Kainan refinery of Fuji Kosan. Idemitsu Kosan also brought on stream at Chiba a 40,000-barrel unit alleged to be the world's first commercial residual fuel oil desulfurizing plant. It is to reduce from 4 to 1 percent the sulfur content of residual fuel oil imported from Kuwait. Operating at full capacity it can produce an estimated 65,000 tons of sulfur annually.

The most important of the 18 Japanese marketing companies in 1967 were, with their percentage of the domestic market: Nippon Oil Co., Ltd. (17.9); Idemitsu Kosan (15.9); Kyodo Petroleum Corp. (10.4); Mitsubishi Oil Co., Ltd. (8.5); Shell Sekiyu, K.K. (8.2); and Maruzen (8.1).

Demand for liquefied petroleum gas (LPG) continued to rise, with about 58.7 million barrels being consumed in 1967. The largest uses were for domestic heating and cooking (38 percent) and the manufacture of chemicals and petrochemicals (28 percent). At yearend Japan's LPG ocean-going tanker fleet, allegedly the largest in the world, totaled 11 vessels with a total carrying capacity of approximately 2.5 million barrels. Five of these (including the newest and largest, the 340,000-barrel-capacity Kazutama Maru) were transporting LPG from Kuwait, five from Saudi Arabia, and one from Canada.

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The Mineral Industry of Jordan

By Walter C. Woodmansee [1]

The mineral industry of Jordan was adversely affected by the hostilities that broke out in mid-1967 but not to the extent of other industrial sectors. A 7-year development plan, approved in 1966, was disrupted. It included phosphate rock and potash development, which were not advanced during the year. Phosphate output and shipments remained fairly uniform throughout 1967; these mines were fairly distant from the contested areas, and production, almost exclusively for the export market, was affected relatively little by the economic slump following the war. However, sales of cement and petroleum refinery products were reduced by the loss of the West Bank markets.

Phosphate rock remained the only major mineral commodity foreign exchange earner. It accounted for about 30 percent of total export earnings and, with expansion underway, it will play a more important economic role in the future.

PRODUCTION

Although data are not available, it appears that output of cement and petroleum refinery products were substantially lower in 1967 than in 1966 and that output of phosphate rock remained about the same as in 1966. Expansion plans in the mineral industry were either modified or deferred. Following the June hostilities, the Zarqa oil refinery operated at half capacity, and cement output was 10 percent of capacity, but toward yearend these operations were improving.

A new steel plant making reinforcing rods went into operation at partial capacity during the year, but production was not officially reported.

[1] Physical scientist, Division of International Activities.

Table 1.—Jordan: Production of mineral commodities

Commodity [1]	1963	1964	1965	1966	1967
Nonmetals:					
Cement—thousand metric tons	285	308	305	375	e 300
Gypsum—metric tons	e 8,700	NA	NA	NA	NA
Marble—square meters	11,450	1,800	e 2,000	e 200	e 200
Phosphate rock—thousand metric tons	614	r 565	828	1,036	e 1,000
Salt—do	18	20	20	13	NA
Mineral fuels: Petroleum refinery products:					
Gasoline—thousand 42-gallon barrels	NA	e 450	460	658	NA
Kerosine—do	NA	e 511	595	547	NA
Distillate fuel oil—do	NA	e 813	954	1,014	NA
Residual fuel oil—do	NA	e 506	600	606	NA
Other—do	NA	e 406	410	366	NA
Total—do	e 2,235	2,686	3,019	3,191	NA

e Estimate. r Revised. NA Not available.
[1] In addition to commodities listed, Jordan also produces limestone for cement manufacture and steel reinforcing rods from imported ingot.

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TRADE

Export of phosphate in 1966 was valued at $8.8 million[2] ($6.8 million in 1965), 30 percent of total export earnings. Principal mineral commodity imports in 1966 were iron and steel, $11.3 million; petroleum, $9.5 million (including $6.8 million for crude oil); and fertilizers, $1.4 million.

The relation of mineral trade to total trade is indicated in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities[1]	Total trade	
Exports and reexports:			
1965	7.1	27.8	25.5
1966	9.4	29.1	32.3
Imports:			
1965	r20.0	156.9	12.7
1966	25.0	191.0	13.0
Trade balance:			
1965	−12.9	−129.1	XX
1966	−15.6	−161.9	XX

[2] Where necessary, values have been converted from the Jordanian dinar (JD) at the rate of JD1=U.S. $2.80.

r Revised. XX Not applicable.
[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.

Table 2.—Jordan: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals:			
Cement	11,217	8,695	All to Saudi Arabia.
Granite and other building stone	5,519	8,983	Lebanon 3,723; Iraq 3,072.
Lime	333	332	All to Saudi Arabia.
Marble	1,312	1,026	Iraq 511; Lebanon 286.
Phosphate (dry)	604,648	755,034	India e320,000; Yugoslavia e190,000; Italy e100,000.
Salt	6,045	8,022	Syria 7,953.
Sand:			
Natural	1,271	1,145	Lebanon 1,089.
Bituminous	15,278	20,549	Lebanon 17,947; Saudi Arabia 2,399.

e Estimate.

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Table 3.—Jordan: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys, semimanufactures	397	612	Mainland China 285; West Germany 108.
Copper and alloys, all forms	172	274	United Kingdom 79; Saudi Arabia 57.
Iron and steel, semimanufactures	68,913	93,395	India 19,805; U. S. S. R. 13,832; Czechoslovakia 10,364.
Lead and alloys, unwrought	344	784	United Kingdom 506; Kuwait 120.
Tin and alloys, semimanufactures long tons	19	31	United Kingdom 29.
Metallic oxides	119	334	Japan 124; West Germany 120.
Nonmetals:			
Caustic soda	888	1,270	United Kingdom 840; Netherlands 164.
Cement	5,379	42,018	Syria 26,700; Iraq 6,892; Lebanon 5,523.
Ceramic construction materials	1,178	1,227	Czechoslovakia 795; United Kingdom 112.
Fertilizer materials:			
Natural: Phosphate	355	354	France 266; United Kingdom 74.
Manufactured:			
Nitrogenous	3,675	6,949	West Germany 3,991; Austria 1,010.
Phosphatic	r2,400	5,107	Lebanon 4,501; West Germany 479.
Potassic	6,248	7,037	West Germany 3,180; Netherlands 1,741.
Other	----	1,132	Kuwait 1,082.
Lime	----	1,648	Lebanon 1,635.
Marble	562	417	Italy 250; Lebanon 98.
Refractory materials, bricks, tiles, etc	----	438	West Germany 235; mainland China 58.
Sulfur in all forms:			
Sulfuric acid	1,112	1,041	Lebanon 957.
Sulfur	2,300	2,082	West Germany 1,044; United States 680.
Mineral fuels:			
Coal, coke, and briquets	554	1,002	Lebanon 592; West Germany 369.
Petroleum:			
Crude—thousand 42-gallon barrels	r2,999	3,438	All from Saudi Arabia.
Refinery products:			
Gasoline, aviation—do	86	48	United States 31; Curacao 16.
Kerosine and jet fuel—do	179	153	Italy 49; Aden 30; Greece 26; Lebanon 25.
Lubricants—do	42	42	United Kingdom 11; Netherlands 10.
Total—do	307	243	

r Revised.

COMMODITY REVIEW

METALS

Iron Ore.—Natural Resources Authority (NRA) investigations continued on the Ajlun deposit, 60 kilometers northwest of Amman. Exploration proved a small, high-grade hematite-magnetite ore body of about 500,000 tons.

Iron and Steel.—The Jordan Iron and Steel Industries Co. plant near Zarqa went into operation in July and, at yearend, was producing at a low level. Plant capacity is 45,000 tons per year. The only product was hot-rolled reinforcing rods for construction use. A United Nations technical advisor was on hand during the early stages of operation.

Manganese.—NRA tunneling operations along the Wadi Dana canyon wall extended manganese ore reserves to about 1 million tons, indicated and inferred. Manganese content is favorable, but associated copper and phosphorus pose metallurgical problems. The U.S. Agency for International Development sponsored a project including the collecting of a bulk ore sample and metallurgical testing at the Bureau of Mines Metallurgy Research Center, Salt Lake City, Utah.

NONMETALS

Cement.—A new kiln under construction at the Jordan Cement Co. plant, jointly owned by the Jordanian Government (49 percent) and private industry (51 percent), was scheduled for completion in May 1968 and will increase capacity to 1,800 tons daily. Consumption and demand for cement were reduced sharply during the last half of the year as a result of the hostilities in June. With the loss of the West Bank market, the number of building

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permits issued in Amman from June to December was about half that for the same period in 1966. Closure of the Suez Canal restricted exports to the Red Sea area and East Africa.

Fertilizers.—Output at the Rusaifa and El Hasa phosphate rock mines was not significantly disrupted by the June war, although expansion of production to an annual rate of 1.2 million tons was not realized. Operations in the two separated mining areas were merged under the Jordan Phosphate Mines Co. At yearend, production was near full capacity. Exports to the East, chiefly India and Pakistan, proceeded normally; West markets were reached via rail to Beirut following the June war.

The Jordanian Government placed high priority on improvement of haulage and port loading facilities at Aqaba. Engineering studies and designs were completed for a 110-kilometer rail spur from Hattiyeh, on the Hedjaz rail line, to Aqaba. This would complete the rail line from the mine through to port; existing haulage necessitates trucking from Ma'an to port. In October the West German Kreditanstalt für Wiederaufbau signed a provisional agreement with the Jordanian Government for a $12.3 million loan toward a total estimated project cost of $19.6 million. The final determination on the economic feasibility of this rail spur was pending at yearend.

A United Kingdom consulting firm completed plans for doubling phosphate storage and loading capacities at Aqaba and also construction of a new berth for 50,000-ton ships. Plans include expansion of storage facilities from existing 20,000 tons to 120,000 tons, and loading capacity from 500 to 1,500 tons per hour with a new conveyor system.

The Jordanian Government was interested in development of a fertilizer industry. Late in the year a United Nations Industrial Development Organization study was underway on a possible triple superphosphate plant at Aqaba.

Potash.—Jacobs Engineering Co., Pasadena, Calif., reportedly recommended a 1-million-ton-per-year potash plant for the Safi project on the Dead Sea shore, but no further action was taken during the year. The hostilities in June caused delays in further planning.

In November, a potash bed was intersected at a depth of 500 meters at a petroleum exploration drill site on Lisan Peninsula along the Dead Sea.

MINERAL FUELS

Petroleum.—Following cancellation of the John W. Mecom concession, NRA continued exploration for petroleum, but its drill rig was capable of drilling to only 1,700 meters. NRA also planned to contract with a private exploration company for geophysical surveys of selected areas. Late in the year, the NRA, drilling on Lisan Peninsula, which projects into the Dead Sea, discovered a salt dome structure. The Arabian Geophysical and Surveying Group (ARGAS), a joint Saudi Arabian Government-French Government company, conducted seismic tests on the peninsula.

The Zerka refinery of Jordan Petroleum Refining Co. (JOPETROL) operated at a reduced rate following the June war. Plans for refinery expansion, originally scheduled for 1966 based on a study of domestic markets by Universal Oil Products Co., United States, were renewed when JOPETROL invited tenders from 14 preselected firms. This $5 to $6 million project would increase annual capacity to 700,000 metric tons of crude oil throughput. The proposed expansion involves new refinery units, including jet fuel capacity, gas-treating units, a liquefied petroleum gas bottling plant, storage tanks, loading facilities, and a 2.25-megawatt steam and diesel generating plant.

A boundary delineation agreement between Jordan and Saudi Arabia in 1966 gave the former 6,000 square kilometers of new territory and placed an additional 4-kilometer length of the Trans-Arabian Pipeline in Jordan, increasing transit fees. Income from these fees was more than $4 million in 1966.

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The Mineral Industry of Kenya, Tanzania, and Uganda

By Eugene R. Slatick [1]

Crude mineral commodities produced in 1967, in these three largely agricultural countries, were valued at $81.2 million,[2] up from $74.6 million in 1966. Based on the value of 1966 mineral trade of the three nations with countries outside the East African Common Market (EACM), Tanzania and Uganda individually had favorable trade balances, but in total the countries recorded $76.3 million in exports and $86.1 million in imports, for a deficit of $9.8 million.

The value of interterritorial exports in 1966 is summarized as follows: [3]

Value of total exports and mineral exports within the EACM, by countries

(Million dollars)

EACM exporting country	Total EACM exports	Total EACM mineral exports	Mineral exports (receiving country)		
			Kenya	Tanzania	Uganda
Kenya	80.9	16.1	--	8.5	7.6
Tanzania	13.0	1.7	1.0	--	.7
Uganda	29.2	2.9	2.2	.7	--

The East African Common Market, formed shortly after the three countries became independent, was dissolved in December 1967 and the East African Economic Community was established. The new organization, provided for by a treaty in June 1967, was formed because of various dissatisfactions with the original arrangement. Under the new treaty, the three countries have agreed to maintain common external tariffs, harmonize monetary policies and fiscal incentives offered for industrial development, and introduce measures to redress the imbalance that has favored industrial development in Kenya.

Of the various services provided to the member countries by the East African Common Services Authority, those of East African Railways and Harbors remained most important to the mineral industry. The railways hauled about 4.5 million tons in 1966, including about 1.7 million tons of mineral commodities (in 1965, about 4 million tons, including 1.5 million tons of mineral commodities in 1965).[4] The import and export tonnages handled at East African ports during 1966 totaled 6.8 million deadweight tons (dwt), including 3.3 million dwt of bulk oil (in 1965 5.8 million dwt, including 2.7 million dwt of bulk oil).[5]

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[1] Foreign mineral specialist, (petroleum), Division of International Activities.

[2] Where necessary, values have been converted at the following rates: Kenya £1=US$2.80; Tanzania shilling 1 and Uganda shilling 1=US$0.14.

[3] Economic and Statistical Review, Published by the East African Statistical Department for the East African Common Services Authority. No. 24, September 1967, pp. 31–33.

[4] East African Railways and Harbors. Annual Report, 1966. 1967, p. 64.

[5] Page 25 of work cited in footnote 4.

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KENYA

Kenya's mineral industry in 1967 continued to be a relatively small contributor to the country's economy. Petroleum refining probably was the most important segment of the mineral industry in terms of contribution to the Gross National Product (GNP). Statistics for the mining industry in 1965, the most recent year for which data are available, are summarized as follows: [6] Labor force, 1,218; expenditures, $2,560,936 ($1,880,766 in mining and milling); basic cash wages paid, $720,860.

An information circular [7] was published covering the investment climate for exploration and mining in Kenya. It is a companion to an earlier publication [8] that discusses the location and geological setting of known mineral occurrences.

PRODUCTION

Kenya's mineral production, excluding petroleum products, was valued at $15.7 million in 1967, down from $18.1 million in 1966. Cement and soda ash, valued at $8.9 million and $3.1 million, respectively, remained the major mineral commodities. During the year the Mombasa oil refinery processed imported crude valued at an estimated $20.3 million producing products valued at an estimated $39.8 million.

[6] Republic of Kenya, Mines and Geological Department. Annual Report, 1965. 1967, pp. 11–12.

[7] Mason, J. E., Legal and Economic Factors Relating to Mineral Development in Kenya. Mines and Geological Dept., Ministry of National Resources, Inf. Circ. 4, 1967, 17 pp.

[8] DuBois, C.G.B., Minerals in Kenya. Mines and Geological Dept., Ministry of Natural Resources. Bull. 8, 1966, 187 pp.

Table 1.—Kenya: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Beryl	-------	1	1	----------	17
Copper, concentrate	2,244	2,077	1,969	793	11
Gold, troy ounces	10,193	12,480	11,420	11,988	33,366
Silver, do	52,422	47,702	21,247	19,003	3,038
Nonmetals:					
Asbestos	71	185	123	66	51
Barite	-------	----------	36	98	212
Carbon dioxide, natural	517	746	762	817	817
Cement, thousand tons	344	422	484	484	479
Diatomite	3,336	3,055	2,218	1,772	1,886
Feldspar	-------	----------	----------	164	402
Gem stone, sapphire and other, carats	800	2,204	4,212	3,525	8,308
Gypsum	20,728	27,994	34,474	33,743	40,446
Kaolin	6,663	1,288	1,714	893	1,456
Lime	NA	4,115	NA	NA	NA
Limestone, other than for cement	16,448	12,095	NA	16,734	19,041
Magnesite	261	170	67	678	422
Meerschaum, kilograms	6,000	204	2,000	694	143
Mica, do	800	(1)	----------	----------	----------
Pumice	1,129	1,438	1,039	793	122
Quartz	259	----------	----------	----------	----------
Salt, thousand tons	17	27	31	r 54	49
Soda, raw crushed	2,342	2,220	2,548	2,463	3,224
Soda ash	103,506	81,670	83,194	112,400	104,755
Vermiculite	92	34	22	76	251
Mineral fuels: Petroleum refinery products:					
Gasoline, thousand 42-gallon barrels	172	1,827	r e 2,226	e 2,447	2,261
Kerosine, do	76	882	r e 1,256	e 1,625	1,646
Distillate fuel oil, do	156	1,671	r e 2,123	e 2,188	2,783
Residual fuel oil, do	515	6,012	r e 6,000	e 5,807	6,580
Liquefied petroleum gas, do	1	57	r e 60	e 65	71
Asphalt and other products, do	-------	64	r e 557	e 365	306
Total, do	920	10,513	r e 12,222	e 12,497	13,647

e Estimate. r Revised. NA Not available.
[1] Less than ½ unit.

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TRADE

Kenya's trade balance in 1966 continued to be unfavorable in both mineral commodities and total trade. By value, petroleum was the most significant mineral item in both exports and imports. Refinery products were the chief mineral exports, valued at $16.7 million in 1966 compared with $13.4 million in 1965. Crude oil imports totaled $25.5 million in 1966, up slightly from the $25.4 million in 1965. Iron and steel semimanufactures, also major import items, were valued at $13.9 million in 1966, compared with $14.2 million in 1965. The value of mineral trade compared with total trade for recent years is given in the following summary:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	22.7	132.1	17.2
1966	25.1	162.6	15.4
Imports:			
1965	50.4	249.3	20.2
1966	55.1	314.7	17.5
Trade balance:			
1965	−27.7	−117.2	XX
1966	−30.0	−152.1	XX

XX Not applicable.
[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.

Late in 1967 Kenya lifted an embargo on trade with the Somalia Republic [9] that had been imposed because of hostilities over border territory.

[9] The Economic Intelligence Unit. Quarterly Economic Review: East Africa. No. 4, December 1967, p. 10.

Table 2.—Kenya: Exports of mineral commodities to countries outside the East African Economic Community [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum, semimanufactures	95		
Copper, unwrought	3,724	1,589	All to Japan.
Gold, troy ounces	13,813	12,019	United Kingdom 8,809; Belgium 3,210.
Iron and steel:			
Scrap	r 8,756	5,718	Japan 3,766; Netherlands 1,950.
Semimanufactures	270	76	Seychelles 53; Rwanda 15.
Silver, troy ounces	29,750	16,924	All to Belgium.
Nonferrous metals scrap	3,004	2,368	Japan 787; Denmark 629.
Nonmetals:			
Cement	r 199,415	169,534	Reunion 65,363; Mauritius 53,150.
Diatomite	1,180	775	United Kingdom 730; Greece 10.
Lime	3	4	Congo (Kinshasa) 3; Rwanda 1.
Salt	18	165	Rwanda 157.
Soda ash, sodium carbonate	r 74,680	106,751	Japan 22,070; U.S.S.R. 20,270.
Stone, sand and gravel	11	6	All to ships stores.
Mineral fuels:			
Petroleum refinery products:			
Gasoline, thousand 42-gallon barrels	46	241	Zambia 116; Congo (Kinshasa) 50.
Kerosine, do.	681	789	Aircraft and ships stores 626; Zambia 102.
Distillate fuel oil, do.	302	448	Aircraft and ships stores 281; Congo (Kinshasa) 44.
Residual fuel oil, do.	r 3,134	3,467	Aden 1,063; Ships stores 919.
Liquefied petroleum gas, do.	50	47	Reunion 21; Malagasy Republic 17.
Asphalt and bitumen, do.	74	99	Zambia 30; Malagasy Republic 27.

r Revised.
[1] Excludes reexports.

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Table 3.—Kenya: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum, all forms	735	666	Belgium 218; United Kingdom 171.
Copper:			
Unwrought	75	62	United Kingdom 51; Zambia 11.
Semimanufactures	280	323	United Kingdom 186; Canada 31.
Gold bullion, troy ounces	6,858	7,034	All from United Kingdom.
Iron and steel:			
Iron ore and concentrate	5,688	6,748	All from Spain.
Iron and steel scrap	96	----	
Pig iron and ferroalloys	1,013	1,523	All from United Kingdom.
Ingots and other primary forms	83	27	Do.
Semimanufactures	r 86,832	82,735	United Kingdom 24,333; Belgium 15,543.
Lead, all forms	203	210	United Kingdom 101; Ceylon 66.
Nickel, unwrought	6	2	All from United Kingdom.
Tin, unwrought, long tons	72	77	United Kingdom 75.
Zinc, all forms	1,234	1,185	Zambia 933; Australia 152.
Nonferrous metal scrap	31	46	Seychelles 42; United Kingdom 4.
Nonmetals:			
Abrasives, grinding and polishing wheels, and stones.	39	29	United Kingdom 15; West Germany 5.
Cement	175	611	Denmark 294; United Kingdom 251.
Feldspar, fluorspar, cryolite and chiolite.	3,235	3,357	United Kingdom Commonwealth countries, not specified 2,937; Spain 368.
Fertilizers:			
Nitrogenous	47,894	31,182	West Germany 21,327; United Kingdom 2,672.
Phosphatic	11,885	21,000	Netherlands 16,485; Belgium 4,292.
Potassic	281	841	France 330; Netherlands 263.
Other, manufactured, n.e.s.	10,490	18,175	Netherlands 14,411; Italy 1,147.
Graphite	16	22	All from United Kingdom.
Lime	36	48	Do.
Mica, crude	34	15	Do.
Salt	5,549	5,483	West Germany 1,860; Pakistan 1,669.
Stone, sand and gravel	328	775	Italy 435; West Germany 183.
Sulfur	1,473	1,432	West Germany 522; United Kingdom 47.
Mineral fuels:			
Solid:			
Coal	r 53,574	47,436	Mozambique 46,944.
Coke	r 1,161	1,888	United Kingdom 1,238; West Germany 620.
Petroleum:			
Crude, thousand 42-gallon barrels	13,646	13,683	Iran 9,346; Kuwait 3,448.
Refinery products:			
Gasoline, do.	r 45	231	All from Iran.
Kerosine, do.	42	681	Do.
Distillate fuel oil, do.	60	113	Do.
Residual fuel oil, do.	5	2	All from Aden.
Lubricating and other oils, do.	104	119	Italy 54; United Kingdom 36.
Other, do.	20	155	United States 104; India 33.

r Revised.

COMMODITY REVIEW

Metals.—*Copper, Gold, and Silver.*—Copper production declined sharply in 1967 because reserves were virtually depleted at the Macalder mine of Macalder-Nyanza Mines Ltd., the country's only copper producer. Silver output also declined because it is produced mainly as a copper byproduct. In the past, a large part of Kenya's gold output also was obtained as a byproduct of copper, but the rise in output in 1967 apparently indicated that the Migori gold vein was being mined. The vein was discovered in 1965 on the lease of Macalder-Nyanza Mines Ltd. Several other operators also produce gold, but on a smaller scale.

Iron and Steel.—Late in 1967 a group of East African industrialists announced plans to build a $2.8 million steel mill at Dundora, near Nairobi. The annual output of the mill is to be about 30,000 tons. The first phase of the project is to build a rolling mill to produce flat and angle bars and rods. Later, an electric furnace will be added to produce ingots from East African scrap.

Nonmetals.—*Cement.*—Local raw materials consumed in cement production in

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1967 included: Gypsum, 40,198 tons; Kunkur Limestone (cement rock), 59,940 tons; limestone, 621,331 tons; shale, 100,091 tons; and volcanic ash 943 tons.

Fertilizer Materials.—Triangle Fertilizer Ltd. was formed during 1967 to manufacture and sell nitrogenous fertilizers. The company is comprised of Albatros Superfosfaatfabrieken N.V., of Utrecht, the Netherlands (40 percent); Covenant Industries Limited, of London, an associated company of Imperial Chemical Industries Ltd. (40 percent); and the Development Finance Company of Kenya Ltd., a governmental agency (20 percent). Work on a $14 million fertilizer plant at Changamwe near Mombasa, was scheduled to start in April 1968. The plant is expected to be operating in 1970 with an annual capacity of 109,000 tons of calcium ammonium nitrate, and will employ about 200 persons. Locally quarried limestones is to be used with ammonia feedstock imported from Iran. The plant is expected to make Kenya self-sufficient in nitrogenous fertilizers, thereby saving about $1.4 million in foreign exchange annually. Some of the output will probably be available for export.

A $308,000 bulk fertilizer blending plant was opened at Nakuru in February 1967. It is a joint venture comprised of Windmill Fertilizers (East Africa) Ltd., Dalgety (East Africa) Ltd., and the Development Finance Company of Kenya Ltd.[10]

Mineral Fuels.—*Petroleum.*—Throughput at the Mombasa refinery in 1967 totaled about 14.5 million barrels, compared with about 13.6 million barrels in 1966. The operator, East African Refineries Ltd., announced plans to increase daily capacity by about 6,500 barrels to give a daily total of about 50,500 barrels.[11]

In April, British Petroleum-Shell Petroleum Development of Kenya abandoned an exploratory well (Wal Merer No. 1) northeast of Garissa, after drilling to 12,446 feet. Exploration in the northeast was done under the protection of securtiy forces because of the hostilities between Kenya and the Somali Republic.

TANZANIA

Tanzania's mineral industry in 1967 continued to be dominated by diamond mining, the mineral industry's chief contributor to the country's Gross National Product and foreign exchange earnings. The mineral industry labor force in 1965 totaled 10,453 (8,579 surface workers, 1,874 underground); the diamond mining and gold mining industries employed 2,483 and 2,293, respectively.[12]

In 1967, major developments in Tanzania's mineral industry were as follows: initiation of construction of a petroleum product pipeline from Dar es Salaam to the Zambia copperbelt; invitation for bids to build a steel rolling mill; and outlining of steps to expand the gem stone industry.

Soviet geologists arrived in Dar es Salaam in December to carry out mineral prospecting and reconnaissance for the Tanzanian Government under a contract signed in November.

Three new deepwater berths and a transshipment shed are to be constructed at Dar es Salaam to facilitate the increasing import-export trade of Zambia. Since Southern Rhodesia's unilateral declaration of independence in late 1965, 145,000 tons of Zambian copper has been shipped from Dar es Salaam.[13]

PRODUCTION

Tanzania's mineral production, excluding petroleum products, was valued at approximately $36 million in 1967, compared with $30 million in 1966. Diamond production was valued at $31 million in 1967, up from $25 million in 1966.

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[10] Overseas Review (London). March 1967, p. 44.
[11] Oil and Gas Journal. V. 65, No. 52, Dec. 25, 1967, p. 153.
[12] Ministry of Industries, Mineral Resources and Power, Mineral Resources Division. Annual Report 1965. Dar es Salaam, 1967, p. 56.
[13] Mining Journal (London). V. 269, No. 6887, Aug. 18, 1967, p. 123.

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Table 4.—Tanzania: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity [2]	1963	1964	1965	1966	1967
Metals:					
Gold—troy ounces	102,917	93,040	90,819	55,473	18,486
Silver—do	22,669	25,329	22,865	10,572	2,294
Tin, content of ore—long tons	234	287	255	353	341
Tungsten, ore and concentrate, 60 percent WO_3	-------	-------	-------	r 7	29
Nonmetals:					
Abrasives, natural	NA	NA	NA	NA	39
Artstone [3]	502	457	27	11	5
Bentonite	-------	5	-------	-------	203
Cement	-------	-------	-------	47,681	149,276
Diamond:					
Gem—carats	275,958	337,711	e 828,356	946,656	{864,345
Industrial—do	312,753	326,059			{123,260
Gem stones, semiprecious and precious, exclusive of diamond '—kilograms	386	956	1,318	2,107	935
Gypsum	1,894	2,957	4,560	4,826	15,479
Kaolin	182	111	NA	310	312
Lime	1,260	2,169	1,428	8,906	5,164
Magnesite	85	495	1,143	4,781	2,038
Meerschaum	16	16	100	NA	56
Mica, sheet and scrap	107	243	271	487	217
Salt—thousand tons	34	33	r 39	41	36
Vermiculite	27	131	98	161	91
Mineral fuels:					
Coal, bituminous—thousand tons	2	1	2	2	2
Petroleum refinery products:					
Gasoline—thousand 42-gallon barrels	-------	-------	-------	e 377	911
Kerosine—do	-------	-------	-------	e 68	234
Jet fuel—do	-------	-------	-------	e 168	322
Distillate fuel oil—do	-------	-------	-------	e 493	1,424
Residual fuel oil—do	-------	-------	-------	e 671	1,986
Liquefied petroleum gas—do	-------	-------	-------	e 20	39
Total—do	-------	-------	-------	e 1,797	4,916

e Estimate. r Revised. NA Not available.

[1] Data given for certain commodities are actually exports.

[2] In addition to commodities listed, construction materials such as clay, sand, gravel, and stone are produced, but quantitative data are not available.

[3] Corundum-zoisite; includes rough amethystine quartz.

[4] Generally includes ruby, sapphire, chrysoprase, corundum, garnet, tourmaline, and zircon, data on some of which were not available.

TRADE

Tanzania continued to have favorable balance of trade in 1966 in both minerals and total trade, as shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	25.3	175.8	14.4
1966	34.1	221.5	15.4
Imports:			
1965	15.5	140.1	11.1
1966	20.3	179.9	11.3
Trade balance:			
1965	+9.8	+35.7	XX
1966	+13.8	+41.6	XX

XX Not applicable.

[1] Values given are for only those commodities listed in tables 5 and 6 of this chapter.

By value, diamond remained the chief mineral and fourth overall export totaling $25.3 million in 1966 compared with $19.9 million in 1965. The major mineral commodities imported in 1966 were, by value, iron and steel semimanufactures, $7.1 million (7.9 million in 1965); petroleum refinery products, $4.4 million ($3.2 million in 1965); and crude oil, $3.6 million.

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Table 5.—Tanzania: Exports of mineral commodities to countries outside the East African Economic Community [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum, semimanufactures	132	185	Ethiopia 54; Zambia 53.
Gold, refined—troy ounces	90,819	55,991	All to United Kingdom.
Iron and steel:			
Scrap	2,355	2,320	Japan 1,981; Netherlands 335.
Semimanufactures	225	387	Zambia 285; Burundi 102.
Silver, refined—troy ounces	22,865	10,572	All to United Kingdom.
Tin concentrate, long tons cassiterite.	r 313	487	United Kingdom 300; Malaysia 187.
Tungsten	-------	11	All to United Kingdom.
Nonferrous metals, scrap	656	1,119	Japan 342; West Germany 207.
Nonmetals:			
Artstone [2]	27	11	NA.
Cement	r 47	4,607	Zambia 3,425; Burundi 675.
Diamond—carats	828,356	905,670	All to United Kingdom.
Gem stones, other than diamond:			
Ruby and sapphire—kilograms	473	241	NA.
Other—do	1,318	2,818	NA.
Gypsum	4,560	1,550	NA.
Lime	r 16	12	All to Zambia.
Magnesite	17,236	1,096	NA.
Meerschaum, scrap	102	---------	
Mica	r 270	498	West Germany 306; United Kingdom 156.
Salt	r 14,892	12,491	Burundi 7,170; Congo (Kinshasa) 4,533.
Mineral fuels:			
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	-------	32	Zambia 23.
Kerosine—do	-------	5	NA.
Distillate fuel oil—do	-------	30	Zambia 17.
Residual fuel oil—do	-------	273	Italy 238; Aircraft and ships stores 21.

r Revised. NA Not available.
[1] Excludes reexports.
[2] Corundum-zoisite rock; includes rough amethystine quartz.

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Table 6.—Tanzania: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Unwrought	2,062	3,403	All from Norway.
Semimanufactures	-------	348	United Kingdom 153; West Germany 95.
Copper, all forms	104	105	United Kingdom 41; Sweden 19.
Gold bullion, troy ounces	2,700	3,676	All from United Kingdom.
Iron and steel:			
Iron ore and concentrate	533	1,485	Spain 757; Norway 257.
Iron and steel scrap	90	21	NA.
Pig iron and ferroalloys	820	1,456	West Germany 1,274; United Kingdom 66.
Semimanufactures	r 40,074	38,689	United Kingdom 10,794; Japan 9,532.
Lead, all forms	59	37	Zambia 20; United Kingdom 8.
Nickel, unwrought	-------	1	All from United Kingdom.
Tin, all forms, long tons	34	17	Do.
Zinc, all forms	2,067	1,186	Zambia 1,171; United Kingdom 13.
Nonferrous metal scrap	52	177	Burundi 78.
Nonmetals:			
Abrasives, grinding and polishing wheels and stone.	22	25	United Kingdom 13; West Germany 3.
Cement	986	2,321	Mainland China 1,617; United Kingdom 345.
Feldspar, fluorspar, cryolite and chiolite.	-------	41	All from United Kingdom.
Fertilizers:			
Nitrogenous	14,895	14,141	West Germany 7,482; Kuwait 2,891; United Kingdom 2,891.
Phosphatic	1,208	949	Netherlands 839; Belgium 107.
Potassic	1,367	1,358	Israel 411; West Germany 281.
Other, manufactured, n.e.s.	4,000	6,637	Netherlands 3,616; West Germany 1,073.
Graphite	-------	3	NA.
Lime	2,026	1,000	West Germany 768.
Mica, crude	13	10	All from United Kindgom.
Salt	2,860	4,443	Aden 1,053; United Kingdom 1,044.
Stone, sand and gravel	560	369	Italy 333; United Kingdom 18.
Sulfur	270	559	Poland 258; Belgium 240.
Mineral fuels:			
Solid:			
Coal	203	137	United Kingdom 132; Netherlands 5.
Coke	321	163	United Kingdom 149; West Germany 9.
Petroleum:			
Crude, thousand 42-gallon barrels	-------	2,116	Iran 1,495.
Refinery products:			
Gasoline, do.	119	342	All from Iran.
Kerosine, do.	164	268	Iran 226; Aden 41.
Distillate fuel oil, do.	282	249	All from Iran.
Residual fuel oil, do.	r 1	---------	
Lubricating and other oils, do.	47	67	United Kingdom 32; United States 19.
Other, do.	11	12	United States 2; West Germany 2.

r Revised. NA Not available.

COMMODITY REVIEW

Metals.—*Gold and Silver.*—Because two of three major gold mining companies closed in 1966 (Geita Gold Mining Co. Ltd., and Tangold Mining, Co. Ltd.), gold production in 1967 was largely by Buhemba Mines Ltd., a subsidiary of Williamson Diamonds Ltd. Reserves at the Buhemba mine were estimated to be sufficient for operations through most of 1968. Small cooperatives continued operating in the Geita, North Mara, Nzega, and Mpanda areas and in the Lupa Goldfields. The decline in gold mining had an adverse effect on byproduct silver production.

The United Nations Special Fund project for exploring the Lake Victoria goldfield concentrated its investigations during the year in the western part of the Musoma District. U.N. sponsored investigations in the Geita area have established the presence of additionai gold mineralization that may be worthy of further investigation.[14]

Iron and Steel.—Near yearend, the National Development Corporation (NDC), a governmental agency, completed a feasibility study for a 10,000-ton-per-year steel rolling mill to manufacture rods, bars, and profiles. Bids were invited for construction of the mill to be located near Dar es Salaam.

[14] Tanzania Trade and Industry. No. 19, July-September 1967, p. 19.

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Nonmetals.—*Cement.*—During 1967, as part of an overall Government program to acquire larger shares in Tanzanian industries, NDC acquired additional shares in the Tanganyika Portland Cement Co. Ltd. giving (NDC) a 50 percent interest. The plant, which began operations in 1966 with an annual capacity of 160,000 tons, supplies about 80 percent of Tanzania's annual cement requirements.

Diamond.—Diamond production in 1967 was mainly by Williamson Diamonds Ltd. and its subsidiaries, New Alamsi Ltd. and Kahama Ltd. Output from the Kahama mine was from stockpiles, which began to be worked in late 1966 after the orebody was mined out. During the year Williamson ordered two draglines for the Mwadui mine from Ruston-Bucyrus, Ltd.[15]

Other Gem Stones.—During the year legislation was being drafted to protect and promote the gem stone industry by creating a gem valuation and marketing organization. Until such legislation is passed, gem stones produced in Tanzania cannot be legally sold in the country except in special cases.

The Government, through NDC, was considering promoting the establishment of a plant for cutting colored gem stones. With such a plant, finished gem products can be exported, thereby enabling the country to increase its foreign exchange earnings.

Mineral Fuels.—*Petroleum.*—The 13,800-barrel-per-day refinery near Dar es Salaam, Tanzania's first, completed its first full year of operations in 1967, producing 4.9 million barrels of products for markets in Tanzania and Zambia. It is owned by Tanzanian Italian Petroleum Co. (TIPER), a joint venture of the Tanzanian Government and Italy's Ente Nazionale Idrocarburi (ENI). Processing units include a 3,500-barrel-per-day catalytic reformer, a 5,000-barrel-per-day distillate hydrotreater. There are storage facilities for about 440,000 barrels of crude and 600,000 barrels of product. The working force totaled 320, including 260 Tanzanians.

During the year an 8-inch refined products pipeline was being built from the TIPER refinery to Bwana Mboukwa, near N'Dola in Zambia. The line will be 1,700 kilometers long and have a 6,000-barrel-per-day capacity when it begins operations in 1968. SNAM Progetti, an ENI subsidiary, is building the $46.5 million line under the supervision of Bechtel Corp. Tazama Pipelines Ltd., a company owned jointly by the governments of Tanzania and Zambia, will operate the line.

UGANDA

Copper mining and smelting continued to dominate Uganda's mineral industry in 1967. Although mineral production makes a relatively small contribution to Uganda's gross domestic product, mineral exports continued to be an important source of foreign exchange earnings. The mineral industry labor force in 1966 totaled 7,810.[16]

Uganda's new constitution, passed in September 1967, gave the Government mineral rights to the entire country. In December an executive order, "The Local Administrations (Performance of Functions) Instrument, 1967," made the Ministry of Mineral and Water Resources the administrator of the Mailo Land System. Under this system, which is practiced in the Kingdom of Buganda, land can be owned only by Africans and may not be leased to non-Africans without governmental approval. The former administrator of these lands, the Government of the Kabaka of Buganda, ceased to exist in May 1966, and there was no administrative body to approve leasing until passage of the executive order. Although mineral deposits have been discovered on mailo land, there have been no major developments.

During the year, the Uganda Geological Survey released the first [17] in a series of publications dealing with the ground followup of an airborne geophysical survey carried out jointly in 1961 by the United Nations Special Fund and the Uganda Government. The report describes areas that warrant further investigations by drilling.

[15] Mining Journal (London). V. 269, No. 6891, Sept. 15, 1967, p. 194.
[16] Uganda Geological Survey and Mines Department. Annual Report, 1966. 1967, p. 21.
[17] Cratchley, C. R., and R. B. Evans. Geophysical Surveys for Mineral Deposits in Area C/D, Western Uganda. Geological Survey of Uganda Special Report. No. 6, 1967, 33 pp.

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In 1966, and presumably in 1967, regional geological surveying was reduced in favor of more detailed appraisal and exploration in known mineralized areas. These studies included copper, sulfide, and graphite indications in Karamoja District; geochemical surveys of carbonatite complexes in Bukedi District; exploratory drilling in the goldfield area of Busia District; investigation of lead anomalies and monazite indications northwest of Mbarara; and the beginning of reserve evaluations of the Lake Katwe salt deposits in Toro District.[18]

No developments were reported during 1967 regarding the Government's proposal to establish a state mining corporation as part of the second 5-year development plan (1966–71). The purpose of this corporation would be to develop mines too small to attract international capital but too large to be operated economically by indigenous miners.

PRODUCTION

Uganda's mineral production in 1967 was valued at $29.5 million, up from $26.5 million in 1966 but down slightly from the record $30 million in 1965. In 1967, as in past years, the major mineral commodity produced was blister copper, which was valued at $16.5 million.

Table 7.—Uganda: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Beryl	380	394	192	248	314
Bismuth, metal content—kilograms	30	--	--	r 64	481
Columbium-tantalum concentrate—do	9,000	5,832	8,130	11,180	27,108
Copper, blister	16,216	18,260	17,141	16,098	14,426
Gold—troy ounces	48	24	36	3	14
Iron and steel: Steel, semimanufactures—thousand tons	e 10	e 10	13	22	24
Lithium minerals, amblygonite	48	20	20	1 71	44
Silver, exports—troy ounces	9	--	--	--	--
Tin, content of concentrate—long tons	165	217	178	122	111
Tungsten concentrate, 60 percent WO_3 basis	2	--	49	r 71	80
Nonmetals:					
Cement—thousand tons	55	73	131	121	139
Lime—do	11	12	20	4	185
Phosphate, apatite	7,071	9,544	16,382	15,798	146,719
Salt—do	3	3	3	2	NA

e Estimate. r Revised. NA Not available.
1 Export.

TRADE

Uganda's mineral trade balance in 1966 was less favorable than in 1965 because of a decline in exports of blister copper, the county's chief mineral export. These exports were valued at $16.1 million in 1966, compared with $22.4 million in 1965. In value, steel semimanufactures were the principal mineral imports in 1966, accounting for $5.6 million compared with $4.9 million in 1965. The values of mineral trade and total trade for recent years follow:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	23.4	175.6	13.3
1966	17.0	184.6	9.2
Imports:			
1965	8.9	114.4	7.8
1966	10.7	120.3	8.9
Trade balance:			
1965	+14.5	+61.2	XX
1966	+6.3	+64.3	XX

XX Not applicable.
[1] Values given are for only those commodities listed in tables 8 and 9 of this chapter.

[18] Page 1 of work cited in footnote 16.

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COMMODITY REVIEW

Metals.—*Beryl.*—Production continued to be mainly from the Ankole and Kigezi districts, although beryl deposits are known in Buganda and Karamoja districts. An appreciable price rise during 1967 stimulated production; sustained high prices reportedly could enable annual output to reach 1,000 tons or more. Beryl reserves were estimated at 26,000 tons.[19]

Copper.[20]—Kilembe Mines Ltd., Uganda's only copper producer and principal mining company, produced 872,295 tons of ore in 1967, 7 percent less than in 1966. The decline was due to difficulties in changing mining methods from open stoping to cut-and-fill-stoping; a shortage of qualified personnel hindered the changeover. Blister copper output declined because of a 22-day shutdown in August for repairs.

Table 8.—Uganda: Exports of mineral commodities to countries outside the East African Economic Community [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Beryl	274	225	United States 183; Japan 42.
Columbium-tantalum concentrate	15	--	
Copper, blister	r 17,562	15,799	United States 8,533; Spain 4,267.
Gold, troy ounces	51	--	
Iron and steel, scrap and semi-manufactures.	r 366	--	
Platinum, troy ounces	5	--	
Tin concentrate, long tons	294	204	All to United Kingdom.
Tungsten concentrate	r 70	106	United Kingdom 70; Netherlands 20.
Nonferrous metals, scrap	10	--	
Nonmetals:			
Asbestos	232	2	All to Rwanda.
Cement	4,306	3,933	Rwanda 3,576; Congo (Kinshasa) 357.
Phosphate, fertilizer	r 8	--	
Salt	449	1,162	Rwanda 642; Congo (Kinshasa) 520.

r Revised.
[1] Excludes reexports.

Reserves of proved and probable ore at yearend 1967 were estimated at 5.9 million metric tons averaging 2.0 percent copper, an increase compared with yearend 1966 reserves. The rise was due mainly to development on the 4,200-foot-level and drilling results below the 4,050-foot-level in the Eastern Ore Deposit. Drilling in the Bahunga area, southeast of the mine, indicated sufficient mineralization to justify underground exploration and development in 1968.

Iron and Steel.—Steel Corporation of East Africa Ltd., owned jointly by the Madhvani Group and the Uganda Development Corporation Ltd. (UDC), installed a $840,000 strip and wire rolling mill at Jinja. The mill is the first of several expansions planned by the company.[21]

No information was available about a study initiated in 1966 to find an economical way to make steel from magnetite obtained from phosphate concentrations at Sukulu, near Toroco. Magnetite resources at Sukulu have been estimated at over 30 million tons.

Tantalite-Columbite. — Tantalite-columbite continued to be produced chiefly as a byproduct of beryl mining in southwestern Uganda. The sharp rise in output in 1967 is attributed to increased exploitation of beryl deposits. Studies continued regarding an economical method of working the country's pyrochlore deposits; the fine size of the pyrochlore causes difficulties in beneficiation.[22]

Nonmetals.—*Cement.*—Uganda Cement Industry Ltd. contracted for the construction of a complete dry process cement plant costing over $5.6 million[23] at Kasese

[19] United Nations Economics and Social Council, Economic Commission for Africa. Beryllium, Columbium, Rare Earths, Tantalum, Titanium, Yttrium, and Zirconium in Uganda. Seminar on new metals and minerals, Addis Ababa, Ethiopia Feb. 5–10, 1968.
[20] Kilembe Copper Cobalt Ltd. Annual Report. 1967, pp. 2–3.
[21] Overseas Review (London). December 1967, p. 46.
[22] Pages 15–16 of work cited in footnote 19.
[23] Mining Journal (London). V. 269, No. 6899, Nov. 10, 1967, p. 351.

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Table 9.—Uganda: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum, semimanufactures	410	485	United Kingdom 364; Austria 54.
Copper	154	161	United Kingdom 99; West Germany 46.
Gold bullion, troy ounces	1,172	3,810	All from United Kingdom.
Iron and steel:			
Iron and steel scrap	48	------	
Pig iron and ferroalloys	526	580	West Germany 307; Norway 141.
Ingots and other primary forms	74	------	
Semimanufactures	25,739	31,870	Japan 13,649; United Kingdom 4,926.
Lead, all forms	r 71	120	Zambia 89; Denmark 11.
Tin, long tons	25	26	All from United Kingdom.
Zinc	251	1,304	Zambia 1,295.
Nonferrous metal scrap	------	8	All from Rwanda.
Nonmetals:			
Abrasives, grinding and polishing wheels and stones.	17	18	United Kingdom 12; Italy 6.
Asbestos, crude	873	1,439	Canada 1,284; Italy 80.
Cement	202	476	United Kingdom 246; Denmark 175.
Feldspar, fluorspar, cryolite, chiolite	3,425	1,230	Mainland China 1,200; France 20.
Fertilizers:			
Nitrogenous	6,416	5,956	Netherlands 2,235; West Germany 1,677.
Phosphatic	1,696	993	Belgium 965; Netherlands 25.
Potassic	380	633	Netherlands 312; Israel 132.
Other, manufactured n.e.s	2,752	5,248	West Germany 2,930; Italy 732.
Graphite	2	------	
Lime	23	4	All from United Kingdom.
Salt	35,710	32,262	Pakistan 8,258; Aden 7,715.
Stone, sand and gravel	194	153	Italy 120; United Kingdom 31.
Sulfur	5,909	5,989	Poland 3,014; West Germany 2,685.
Mineral fuels:			
Solid:			
Coal	83	60	United Kingdom 20.
Coke	124	17	All from West Germany.
Petroleum refinery products, thousand 42-gallon barrels	96	118	Iran 76; United States 17; United Kingdom 13.

r Revised.

in southwestern Uganda, where proved limestone reserves total 23 million tons. The existing cement plant, at Tororo, reported a record year in 1966, when 120,000 tons of cement was sold.[24]

Fertilizer Materials.—During 1967 UDC announced plans to exploit apatite deposits in the Tororo area and build a triple superphosphate plant. Imperial Chemical Industries Ltd., who had prepared a feasibility study on the project, offered to finance, build, and operate the plant in partnership with UDC. The project would cost about $11 million. UDC reportedly was also seeking to make arrangements with a company in Mombasa, Kenya, to build a mixing installation to produce a complex fertilizer for distribution in East Africa. Tororo Industrial Chemicals and Fertilizers Ltd., a UDC subsidiary, raised the capacity of its fertilizer plant from 25,000 tons to 33,000 tons of single superphosphate annually.[25]

[24] Uganda Development Corporation Ltd. Annual Report. 1966, p. 4.

[25] The Economic Intelligence Unit. Quarterly Economic Review: East Africa, No. 3, August 1967, p. 17.

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The Mineral Industry of North Korea

By R. A. Pense [1] and J. M. West [2]

North Korea's economy relies to a considerable degree on the mining and metallurgical industries. Except for petroleum and natural gas the country is fairly well endowed with mineral raw material resources. In 1967 the mineral industry of North Korea ranked in the second order of magnitude in the Far East, much smaller than those of Japan and mainland China. Output of tungsten, graphite, and magnesite have traditionally been of world importance. The country's relatively extensive resources of low-grade coal and iron ore have been of great importance in the development of its moderate-size iron and steel industry.

By the end of 1967 the North Korean economy seemed to have fallen considerably short of long term objectives, in contrast to rapid gains in South Korea. Output of coal, iron and steel, electricity, and chemical fertilizers, considered key items in planning, all were lower than originally planned, some apparently by as much as one-half. Even with the prolongation (announced in 1966) of the original 7-year plan (1960–67) to 1970, and a reduction in expectations, the targets for most of these items were still beyond immediate reach. Increased defense spending in recent years has been cited as one of the major reasons for the economy's apparent shortcomings.

During 1967 particular concern was expressed over the slow pace of new development in the mining and electric power industries. Priorities were declared for these sectors, upon which the entire economy was stated to be dependent. In the draft budget of 3,964 million won submitted by the Government for 1967, mining and electric power were two of the industries singled out for particular attention. The mining sector was to receive 20 percent more funds than in 1966, principally for geological survey work, scientific research and capital improvements to increase productivity. The number of survey workers was to be increased, and various kinds of drilling and geophysical prospecting equipment, surveying instruments, and other mining equipment were to be procured. The principal capital construction programs mentioned were the development of the Yonghung coal mine along with other new coal and ore mines, the expansion of existing mines, the adoption of large-scale strip mining, and the establishment of large new mineral treatment facilities. The power industry was also to be given a 20 percent increase in funds. Most of this increase appeared to be for the completion of thermal powerplants already underway, principally the Pyongyang and Pukchang installations. As a result of these and other projects, output of electric power in 1967 was roughly twice the 12 percent increase over 1966 that was planned.

In the same budget, investments in the metallurgical industry, principally the Kimchaek iron and steel plant, were to be tripled. In preparation for a 1-million-ton increase in steel capacity at Kimchaek, iron ore treatment facilities, such as ore-sizing, sintering and pelletizing plants, scrap processing installations, and rolling and fabricating equipment were all to be expanded or added. The chemical industry, which included fertilizers, artificial fibers, and petroleum products among its outputs, was scheduled to obtain "huge" new allocations. Among specific projects were the continuation of construction on ammonia and urea units and preparatory work for the construction of a petroleum refinery.

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PRODUCTION

Claims to increased annual production were made during 1967, and in some instances substantial gains apparently were attained. Industrial production in the first half of 1967 was stated to have been 19.1 percent greater in value than in the same period of 1966. Increases in steel industry output over the first half of 1966 were claimed as follows, in percents: pig iron 14.6, crude steel 13.1, rolled steel 14.8, special steel 35.2, and seamless tubes 32.0. Coal production was apparently roughly 10 percent ahead of the 1966 level at midyear. Fertilizers and agricultural chemicals were reportedly up 33.5 percent and 65.6 percent, respectively. After a first quarter claim of a 14-percent rise, no further overall data was issued on cement production.

In terms of the long-range goals formerly set for 1967 but now extended to 1970, outputs of cement, chemical fertilizers, and coal fell far short of the respective 4.0 to 4.5 million metric tons, 1.5 million tons, and 23 to 25 million tons established. Steel production appeared certain not to attain the reportedly established objective of 2.8 million tons annually by the end of 1968.

Table 1.—North Korea: Production of mineral commodities [1]

(Thousand metric tons unless otherwise specified)

Commodity [2]	1963	1964	1965	1966	1967
Metals:					
Cadmium, electrolytic metric tons	100	100	100	100	105
Copper:					
Mine	8	10	r 10	12	12
Electrolytic	10	10	12	12	12
Gold troy ounces	160,000	160,000	160,000	160,000	160,000
Iron and steel:					
Iron ore and concentrates	3,860	4,800	5,900	6,000	6,500
Pig iron [3]	1,159	1,340	1,450	1,500	1,750
Steel ingot	1,022	r 1,132	1,230	1,300	1,450
Rolled steel	762	950	1,080	1,100	1,300
Ferroalloys	25	30	35	35	45
Lead:					
Mine	50	55	60	60	65
Smelter, primary	40	45	50	50	55
Nickel, electrolytic metric tons	400	500	1,000	1,000	1,000
Silver troy ounces	r 650,000	r 650,000	r 650,000	r 650,000	700,000
Tungsten concentrate metric tons	4,000	4,000	r 4,500	r 4,500	4,500
Zinc:					
Mine	100	100	105	105	115
Electrolytic	65	70	75	75	80
Nonmetals:					
Apatite	200	200	200	r 250	250
Barite	70	70	80	r 100	100
Cement	2,530	2,610	2,400	2,500	2,600
Fluorspar	30	30	30	30	30
Graphite	70	70	70	75	75
Magnesite:					
Ore as mined	800	900	900	1,000	1,000
Clinker	385	400	400	r 450	500
Pyrite	400	420	450	500	500
Salt	450	400	500	550	550
Talc and soapstone	30	40	50	50	50
Mineral fuels:					
Coal:					
Anthracite	9,700	11,200	14,500	15,500	17,000
Bituminous [4]	4,000	3,000	3,000	3,800	4,200
Other	340	300	300	200	200
Total	14,040	14,500	17,800	19,500	21,400
Coke	1,200	1,400	r 1,500	r 1,500	1,800

r Revised.

[1] All figures are estimated, except for iron and steel items (1963–64), magnesite (1963 only), and coal (1963–64). The firm figures are official North Korean data.

[2] Many other mineral commodities are produced, but reasonable output estimates cannot be made. These include antimony, beryl, bismuth, chrome, cobalt, manganese ore, mineral sands (ilmenite, zircon, columbite, rutile, monazite), minor and rare metals (selenium, tellurium, germanium, indium, silicon), molybdenite, alum, arsenopyrite, asbestos, boracite, clays, kaolin, lepidolite, limonite, mica (phlogopite), and silica (including glass sands).

[3] Includes Krupp-Renn granulated iron or luppe.

[4] Low calorific value, much of which might be classified as low-rank coals.

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TRADE

Minerals and metals remained significant in North Korean trade, with the U.S.S.R., mainland China, and Japan as the principal trading partners. Many of the trade agreements signed in 1966 and 1967 included exchanges of foreign minerals or mineral and metal processing equipment in return for North Korean metals. A trade and technical assistance agreement signed with the U.S.S.R. in June 1966 and covering 1967–70 envisaged large increases in trade compared with 1961–65; these increases were confirmed in an agreement signed in October 1967 for 1968 trade between the two countries. Among other items, North Korea will supply pig iron, ferroalloys, rolled steel, nonferrous metals, and nonmetallic minerals. In return the U.S.S.R. will provide rolled metal products, chemicals, and tentative assistance in building North Korea's first petroleum refinery. Under a protocol with mainland China covering 1967 trade, Chinese coal, ferroalloys, steel, and petroleum products were to be taken in partial exchange for minerals, cement, chemicals, and other products.

Trade agreements in effect with other countries during 1967 involved the import from Pakistan of various ores and minerals in return for pig iron, nonferrous metals, and fertilizers; the import from Albania of pitch and chromite for rolled steel; the import of mining, and cement plant equipment from Poland for minerals, steel, and tools; and the import from Singapore of steel pipes and tin for tools, other steel products, graphite, and barite. In addition, North Korean steel or tools were being exchanged with East Germany for potash, with Cuba for nickel, with Hungary for aluminum, with Bulgaria for lead and zinc, and with Mauritania for iron ore.

Specific trade data are not available from official North Korean sources, nor does mainland China report its trade in detail. Information from official U.S.S.R. and Japanese sources has been substituted in table 2 to indicate North Korean exports during 1965–66. Data from Japan for 1967 indicates that, of the principal North Korean exports to Japan, substantially more iron ore, pig iron, silver, magnesia clinker, amorphous graphite, and anthracite were sent than in 1966, but considerably less zinc concentrate and metal.

Special United Nations trade data for West European countries, available only for 1965, show that some North Korean exports of nonferrous base metals have reached the non-Communist countries of Europe. West Germany was the principal recipient of these metals (largely unwrought zinc) in 1965. Of the 13,964 metric tons of zinc delivered to West Europe, West Germany received 5,665 tons, the Netherlands 2,704 tons, Belgium-Luxembourg 2,540 tons, and Sweden 1,134 tons.

Imports from the U.S.S.R. were about the same level in 1966 as in 1965. Aside from petroleum, as shown in table 3, in 1966 these included 1,600 metric tons of asbestos, 6,000 tons of ferroalloys, 2,200 tons of steel pipes, 3,300 tons of other rolled ferrous metal, 1,000 tons of nonferrous metal and alloys (almost all aluminum), and 500 tons of rolled nonferrous products.

Imports from Japan decreased sharply in 1966, probably because of deteriorating political relations between the two countries. The most noticeable drops were in iron and steel, where 978 tons were imported in 1966 compared with 35,274 tons in 1965, and in fertilizer materials, where 3,000 tons were imported in contrast to 21,200 tons the previous year.

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Table 2.—North Korea: Exports of selected mineral commodities to the U.S.S.R. and Japan

(Metric tons unless otherwise specified)

Commodity	U.S.S.R.		Japan	
	1965	1966	1965	1966
Metals:				
Cadmium	NA	NA	23	14
Copper	-------	-------	136	227
Iron and steel:				
Iron ore	-------	-------	407,524	456,053
Pig iron	47,700	35,400	97,563	164,009
Sponge and granulated iron	-------	-------	2,988	10,867
Ferrosilicon	1,500	800	20	275
Rolled steel	66,500	59,800	-------	-------
Lead:				
Concentrate	-------	-------	867	2,063
Metal	16,600	13,300	762	3,046
Silver troy ounces	-------	-------	32,149	373,854
Titanium ores	-------	-------	1,478	226
Zinc:				
Concentrate	15,900	10,000	14,117	19,404
Metal	8,000	8,100	1,489	4,490
Nonmetals:				
Barite	45,700	60,800	2,314	280
Cement	67,000	311,000	-------	-------
Fluorspar	NA	NA	3,639	5,250
Graphite (mostly amorphous)	-------	-------	6,035	4,950
Magnesia clinker	137,900	106,400	10,469	13,605
Magnesite	-------	-------	1,577	620
Quartz and quartzite	-------	-------	2,322	1,914
Soapstone	NA	NA	2,471	2,022
Talc	21,900	16,200	2,241	3,142
Mineral fuels: Anthracite	-------	-------	13,573	68,094

NA Not available.
Source: Derived from official import statistics of the U.S.S.R. and Japan.

Table 3.—North Korea: Imports of petroleum products from the U.S.S.R. [1]

(Thousands of 42-gallon barrels)

Commodity	1965	1966
Gasoline	1,470	1,540
Kerosine	12	86
Distillate fuel oil	1,313	1,070
Residual fuel oil	15	90
Lubricating oil	251	217
Grease	12	9
Paraffin	9	15
Other	9	10
Total	3,091	3,087

[1] North Korea's main source of petroleum products is the U.S.S.R.
Source: Data derived from official export statistics of the U.S.S.R.

COMMODITY REVIEW

METALS

Iron Ore.—Musan remained the country's leading iron ore mine. Shipments to Japan from this source during 1967 totaled 526,000 metric tons, 15 percent more than the previous year. Japan was offered 700,000 tons of 59 percent iron ore from Musan, to be delivered over a 1-year period beginning April 1968; however, contracts were signed for only 485,000 tons. Claims were made at midyear that the Sohung and Unyul mines, the latter of which is believed to be producing in excess of 1 million tons of crude iron ore, had attained their half-year quotas. During October the Yopo mine, which produces relatively high-

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grade ore, as well as the Chongsan, Songchon, and Suan mines were reported as having successfully achieved their yearend targets. At Pyongsu a new working was opened in 1967 which was to more than double output at that mine.

Iron and Steel.—By yearend 1967 it appeared that negotiations with Vereinigte Oesterreische Eisen und Stahlwerke, A.G., the important Austrian steel firm, for construction of a major new steel plant had finally been terminated. As no other facilities were erected during the year, emphasis was placed on increasing production through expansion and more efficient use of existing equipment. At the Kangson plant all output goals were declared to have been met at midyear. These included crude steel and rolled steel, which slightly earlier had been reported running 27 and 20 percent, respectively, ahead of the previous year's pace. The heat time of the plant's Bessemer converter allegedly was reduced 90 minutes by expanding the use of oxygen and adopting the method of injecting pulverized lime. A blooming unit was credited with having produced a record 360,000 metric tons during 1967. Facilities at the raw material storage area, blooming mill, and pipe shop were augmented. Zinc-coating equipment was added at the wire shop and tin-plating equipment at the sheet shop.

Production schedules at the important Hwanghae, Kimchaek, and Chongjin plants were all reported as having been reached or exceeded at midyear. The heat time of open hearth furnaces at Hwanghae was reportedly reduced substantially; the No. 6 open hearth was allegedly producing twice as much steel in August as at the beginning of the year. New zinc- and tin-plating facilities came gradually into operation during 1967 at Hwanghae, and output from these facilities was alleged to have increased by one-half. At Kimchaek a new deoxidizing unit was reported installed and a sintering shop expanded. As a result of remodeling, the blooming mill at Chongjin improved its operating efficiency.

During 1966, 50 new steel products, including seamless steel pipe and heat-resistant stainless steel, were said to have been manufactured. Calls continued to be made in 1967, nevertheless, for expanding the types and quality of steel produced. Particular attention was drawn to cold rolling and thin plates. Much of this interest can probably be attributed to the important position steel products, particularly tools, occupy in North Korea's foreign trade.

In the future, because of the shortage of coking coal, the expansion of pig iron production was declared largely dependent on the creation of additional granulated iron facilities using anthracite or powered bituminous coal rather than coke. While a new 200,000 to 300,000 ton-per-year granulated iron plant at Kangson was proposed, the complete technology of this process apparently had not been satisfactorily worked out.

Nonferrous Metals.—A number of ore-dressing units were added and several smelters enlarged during 1966 and 1967. The Komdok lead-zinc mine was the principal identified recipient of new ore-treatment facilities; by the end of November this mine was reported to have met its yearend target, including the higher output expected because of the commissioning of the new unit. The Nagyon copper mine apparently met its midyear goal and the Kapsan copper mine, one of the two main copper mines in North Korea, claimed to have fulfilled its entire 1967 quota by October.

The Munpyong lead-zinc smelter on the eastern coast, with a zinc capacity of over 60,000 tons per year, and the Namp'o smelter on the western coast, which had at least a 20,000-ton zinc capacity and a 5,000-ton copper capacity both received unstipulated capacity increases. At Namp'o, major increases in output over half-year 1966 were declared at midyear 1967 in its smelting, refining, and rolling shops. By October North Korea's third major nonferrous smelter, the Hungnam plant on the eastern coast, had reportedly overfulfilled its entire 1967 objective.

Construction of an alumina plant, as the first step in creating an aluminum industry, was mentioned as a future project of great importance.

NONMETALS

Cement.—Additional large kilns with associated rock crushing equipment were scheduled for installation at the existing Madong and Sunghori cement plants in 1967. Construction at Humhung of a relatively small, new 10,000-ton-per-year plant using local raw materials, reportedly begun in 1966, apparently continued in

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1967. The Sunghori plant was specially cited near yearend for having increased its output above goals. Better use of existing equipment was reported during 1967 at most of the major plants.

At yearend 1967 Madong was believed to be the most important producer in North Korea; facilities at two installations at Madong probably had a capacity in excess of 1 million tons. Sunghori and Haeju were also apparently major producers, with capacities somewhere between 500,000 and 1 million tons.

Fertilizer Materials.—Production of fertilizers, which probably exceeded 1 million metric tons in 1966, was targeted to rise by some 40 percent during 1967. Both nitrogenous and phosphatic fertilizer capacities were expanded. Facilities for the output of nitrolime were expanded at the Chongsu and Sunchon plants, with an entirely new unit commissioned at Sunchon in April 1967. At Hungnam, where a 250-ton-per-day urea unit went on stream in 1966, construction began on a second unit. The fourth and last stage of an ammonia synthesis plant, based on anthracite gasification, was completed, along with a sulfuric acid unit. As a result, production of ammonium sulfate was stated to have risen 28 percent during the first half of 1967. An urea unit was also being built at the Aoji plant in 1967, after an expansion of ammonia production capacity in 1966. The first stage of a new ammonia synthesis unit similar to that at Hungnam was finished in April 1967, and the second stage started. Negotiations initiated with Japanese interests in 1965 for the purchase of urea and ammonia plants remained unconcluded at yearend 1967.

Strenuous and apparently successful efforts were made to increase the supply of apatite used to produce superphosphates. The important Tongan and Pakchon mines were reported to be overfulfilling their output quotas during 1967 by a wide margin. A cableway and additional ore crushing and concentration units were being constructed at the Tongan mine.

Magnesite.—Production plans at the Yongyang magnesite mine, North Korea's leading producer, were apparently greatly exceeded in 1967. Exports of magnesite and magnesia clinker continue to be important items of foreign trade. The U.S.S.R. is the most important known destination of magnesia clinker. The principal identified recipient of magnesite is Poland, which reported importing about 82,000 metric tons in 1965 and 87,000 tons in 1966.

MINERAL FUELS

Coal remains the basis of North Korea's fuel economy, despite continuing imports of petroleum products from the U.S.S.R. and mainland China and an apparent U.S.S.R. commitment to assist in building a refinery. Coal mining is perhaps the economic sector where performance has come closest to meeting the ambitious goals set in recent years. Nevertheless, even greater efforts and investments seemed to have been considered necessary in 1967 to keep supply up with demand. About 195,000 meters of basic and 21,000 meters of preparatory tunneling were to be driven, and 13 million cubic meters of earth moved in 1967, mostly in connection with development work in the Yonghung area of South Hamyong Province. Activity here is to include the development of a strip mine which will eventually produce 1.5 million metric tons of coal annually.

During January–July production was claimed to be 10 percent above that of the same period of 1966, and productivity greatly increased through the installation of five new preparation plants. The large Anju bituminous coal mine, in South Pyongan Province on the west coast, was praised for having substantially exceeded its goal during the first half of 1967, as well as having met all its monthly and annual targets in the previous 4 years. Rationalization was apparently being carried out successfully at Anju, with lower costs and greater productivity resulting. Appropriate advance rock-driving was said to be taking place, at a 20 percent faster speed than before. Proper attention was also apparently being given at Anju to the uncovering of new reserves. The Aoji and Toksan mines were reported to have satisfactorily met their annual quotas by yearend 1967; the Yongdong mine, which produces lump coal with a high caloric content, and the Changan mine overfulfilled their 1967 targets. At midyear the Hamyon, Kogonwon, Namjon, Samsin, Sinchon, Sudong, and Ukok mines were cited as having reached or exceeded their goals.

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The Mineral Industry of South Korea

By R. A. Pense[1] and Jean W. Pressler[2]

During 1967 South Korea embarked on its second 5-year Economic Development Plan. Gross national product (GNP), projected to rise by 7 percent annually, actually increased 8.4 percent in 1967; this was only slightly less than the 8.5-percent average annual growth rate under the previous 5-year plan. Of the total GNP of $3,664 million (1965 constant dollars)[3] in 1967, the mining and manufacturing sectors accounted for about 22.3 percent, with the mining sector alone providing about 1.8 percent or $66 million. This amount was approximately 9.2 percent more than the previous year, largely because of increased outputs of coal, nonmetallics (particularly limestone, salt, and silica stone) and base metals and higher prices received for tungsten and gold. Several important mineral processing industries, included in the manufacturing sector, such as cementmaking, fertilizer production, and petroleum refining, also contributed significantly to GNP in 1967.

In terms of quantity, the mining index in 1967 was reported preliminarily at 118.9, compared with 110.8 in 1966 (1965=100.0). Indexes of individual components of the mining sector and of identified mineral processing industries, on the same base year, were as follows:

	1966	1967
Coal mining	113.3	119.7
Metallic mining	108.1	102.2
Nonmetallic mining	104.1	138.9
Petroleum and coal processing	124.3	149.0
Nonmetallic processing (including cement)	117.7	154.2
Base metal processing	119.3	129.0
Metal products	113.3	141.6

Under the second 5-year plan the Government proposed to channel approximately $65 million to the mining sector, slightly over half of which was to be invested in coal mining. Among the announced objectives were (1) a rise of roughly 20 percent in coal production; (2) erection of an ore-preparation plant at the recently discovered Hongchon Chaun iron ore deposit; (3) maintenance of tungsten and bismuth national production levels through development of deep-level mining at the vital Sangdong mine; and (4) geochemical surveying of about 44,000 square kilometers to delineate metallogenic provinces, to be followed, if necessary, by the drilling of up to 150 kilometers of samples and cores.

Approximately $131 million was to be invested in the metal producing industries, the largest single portion of which ($85 million) was for a new integrated iron and steel plant. The petroleum industry was to be allotted about $60 million, aimed principally at increasing refining capacity from 35,000 to 200,000 barrels daily. Investment of $45 million in the cement industry was intended to increase cement capacity roughly 2.5 times to 4.5 million metric tons annually. About $174 million was scheduled for the expansion of chemical and fertilizer outputs, including the establishment of 2 petrochemical complexes.

During 1967 much was done to implement development plans. Tentative agreement was reached for the establishment of the new integrated steel plant. Petroleum refining capacity at the one refinery

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[3] Where necessary, values have been converted from Won to U.S. dollars at a rate of Won 270 = $US1.

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at Ulsan was increased to 55,000 barrels in May, and further expansion to 110,000 barrels in 1968 immediately begun. Site clearance work for a second refinery of 55,000 barrels was initiated in March at Yosu on the south coast, and in April a tentative agreement was signed for the building of another refinery of roughly similar capacity. Cement capacity increased by 900,000 metric tons in 1967, and construction continued on a plant with an announced capacity of 1.7 million tons at Samchok on the east coast. A joint venture agreement was reached for the erection of a naphtha cracker vital to the establishment of the first petrochemical complex. Within the space of 1 month in early 1967 three fertilizer plants went on stream, adding 200,000 tons of ammonia, almost 500,000 tons of urea, and 360,000 tons of mixed fertilizers to South Korea's annual fertilizer capacity. One of these new installations was a nitrogenous fertilizer plant claiming to have the world's largest prilled urea capacity.

Foreign investment is expected to play an important role during the second 5-year plan. Roughly 30 percent of the total funding is to come from abroad, probably principally from the United States and Japan. Japanese capital has become prominent in steel and cementmaking, and U.S. funds in the petroleum refining and petrochemical industries; both have invested heavily in fertilizers and electric power. As an encouragement to foreign investors a new Foreign Investment Law, said to be one of the most liberal in the Far East, was passed in 1966.

Several organizational changes in Government agencies were enacted in 1967 which involved mineral resource development. The most important was the formation of the Korean Mining Promotion Corporation to assist private mines by leasing mining equipment too expensive for individual operators to purchase, conducting costly underground reserve exploration, providing technical advice and services, and recommending individual mining companies for Government and bank loans. U.S. technical and financial assistance, channeled largely through the Agency for International Development (AID) and including substantial amounts of surplus U.S. Government industrial equipment, was an important factor in the establishment of this organization. During the first year 11,000 meters of exploratory tunneling was to be done at 56 mines and machinery loaned to 150 operators. The Taejon Mineral Laboratory was reorganized into the National Mining Research Center in order to take charge of experimental research and direct the technology used in survey work, mining, ore processing and refining, and ore analysis. The Office of Geological Survey (OGS), which has responsibility for geological survey, preparation of geological maps, ore deposit surveys, mineral research, and geophysical and geochemical exploration, also underwent a largely internal reorganization.

The United States-based International Mineral Engineers (IME) continued to supply technical advice and aid to the South Korean mining industry through a contract with AID. In addition to assisting OGS in the geochemical surveying program, 40 percent of which was completed in 1967, IME submitted a number of investigative reports on individual mines and mining prospects and carried out a training program in mine mechanics for machine operators.

Despite the 175,000 kilowatts of generating equipment added in 1967, bringing yearend public utility capacity to 944,000 kilowatts, power shortages resulted in the latter half of the year. This retarded operations at cement and fertilizer plants and small mines.

PRODUCTION

South Korea continued to be a significant world producer of anthracite, tungsten, bismuth, fluorspar, graphite, and talc. However, anthracite remained by far the most important mineral mined in terms of value to the economy, and production of it increased somewhat in spite of industry falterings which lead indirectly to a drop in coproduct amorphous graphite output. Japanese markets continued to play an important role in South Korea's mining industry, with production of fluorspar, crystalline graphite, pyrophyllite, talc, and particularly silica stone rising because of increasing demand in Japan, and iron ore output falling because of stronger competition from ores of other origin. Firm world prices stimulated a

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further rise in output of metallic bismuth but could not arrest a 6-year decline in tungsten production. Under the impact of strong domestic demand and major plant expansions, outputs of cement (and consequently limestone), refinery products, and fertilizers increased substantially.

Table 1.—South Korea: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Antimony concentrate (60 percent antimony)	----	----	----	97	110
Bismuth:					
Concentrate (25 percent bismuth)	528	500	e 400	e 350	e 450
Smelter (99 percent bismuth)	135	132	80	97	112
Copper:					
Ore (2 to 10 percent copper)	12,297	12,147	r 22,184	21,073	15,561
Content of metal e	615	850	r 1,143	r 1,156	1,400
Electrolytic	2,379	2,810	r 2,697	3,872	3,698
Gold, fine [1] troy ounces	90,092	75,791	62,836	60,765	63,337
Gold-silver ore	----	----	----	29,055	NA
Iron and steel:					
Iron ore and concentrate (55 percent iron) thousand tons	501	685	735	789	698
Pig iron do	r 8	r 7	r 26	r 43	e 31
Steel ingots (mostly from scrap) do	162	r 167	r 190	r 215	e 329
Lead:					
Concentrate (55 percent lead)	3,834	6,695	8,849	13,890	17,607
Smelter	----	e 40	e 800	1,608	2,987
Manganese ore (35 percent manganese)	4,155	4,312	6,691	5,972	7,241
Molybdenum concentrate (90 percent MoS_2)	130	223	376	553	516
Nickel ore (3 percent nickel)	855	r 608	37	r ----	----
Silver, fine thousand troy ounces	444	404	434	499	588
Tin concentrate long tons	----	----	r 3	55	66
Tungsten ore and concentrate (70 percent tungsten trioxide)	4,740	4,657	3,837	3,703	3,648
Zinc:					
Concentrate (50 percent zinc)	2,260	5,080	14,232	23,386	27,428
Oxide	2,568	3,130	2,395	r 1,286	1,060
Electrolytic	----	----	----	1,424	2,548
Nonmetals:					
Asbestos	1,923	1,272	1,551	623	2,166
Barite (95 percent barium sulfate)	2,758	2,743	1,287	36	----
Beryl (10 percent beryllium oxide)	----	----	----	----	8
Cement thousand tons	778	1,242	1,614	1,884	2,440
Diatomite (80 percent silicon dioxide)	1,694	r 563	579	275	2,238
Feldspar	11,575	13,684	15,845	15,294	16,817
Fluorspar (75 percent calcium fluoride)	39,785	56,397	39,167	32,008	56,968
Graphite:					
Amorphous (75 percent carbon)	337,985	262,382	254,251	128,780	61,455
Crystalline (85 percent carbon)	1,692	2,076	2,768	2,161	2,426
Kaolin	52,262	60,536	72,244	112,234	102,676
Limestone (48 percent calcium oxide) thousand tons	1,363	2,220	3,090	2,926	3,916
Monazite	----	----	r 25	12	13
Pyrite	38	60	171	3,745	4,411
Pyrophyllite	32,811	46,158	48,914	54,690	66,952
Salt (80 percent sodium chloride) thousand tons	230	386	669	393	524
Silica sand (95 percent silica)	16,363	49,718	34,008	r 37,743	43,958
Silica stone (98 percent silica)	26,673	57,064	74,251	99,512	228,803
Talc	32,393	43,900	35,732	53,609	56,280
Mineral fuels:					
Carbon black	125	315	329	e 400	NA
Coal, anthracite thousand tons	8,858	9,622	10,248	11,613	12,436
Fuel briquets (anthracite-clay mix) do	3,452	5,976	6,738	NA	NA
Peat do	116	r 62	r 107	r 75	e 100
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	----	583	1,411	r 2,020	2,615
Solvent do	----	11	33	r 53	77
Kerosine do	----	316	512	r 735	1,366
Jet fuel do	----	0	421	r 740	842
Distillate fuel oil do	----	1,150	3,076	r 3,862	4,036
Residual fuel oil do	----	2,721	4,635	5,236	7,272
Liquefied petroleum gases do	----	NA	28	58	99
Other [2] do	----	----	----	----	687

e Estimate. r Revised. NA Not available.

[1] Officially reported gold only.

[2] Includes 492,000 barrels of naphtha and 184,000 barrels of asphalt.

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TRADE

Minerals and mineral products have been of decreasing importance in South Korea's overall trade in recent years. Mineral exports in 1967 accounted for only about 11 percent of total exports of $320.2 million, compared with 16 percent in 1966 and 24 percent in 1965. Imports of minerals constituted 22 percent of overall imports of $999.5 million in 1967, compared with 29 percent in 1966 and 31 percent in 1965. The following shows this overall trend and the changes in the major components of South Korean mineral trade 1965–67:

	Value (million dollars)		
	1965	1966	1967 p
Exports:			
Mineral commodities:			
Metallic ores (mostly tungsten and iron)	r 17.3	20.9	21.6
Nonmetallic ores	4.3	4.7	5.8
Iron and steel	12.7	8.1	1.9
Other	6.4	4.9	3.6
Total [1]	40.7	38.6	32.9
Other commodities	134.4	210.9	287.3
Total exports	175.1	249.5	320.2
Imports:			
Mineral commodities:			
Iron and steel scrap	5.1	13.3	17.5
Nonmetallic ores (including crude fertilizer materials)	4.7	5.1	12.6
Manufactured fertilizer materials	r 65.8	88.9	43.9
Iron and steel	24.7	39.5	59.3
Nonferrous metals and products	9.0	11.2	12.4
Nonmetallic products (mostly cement)	1.5	6.1	12.5
Petroleum and products	28.9	40.6	59.4
Other	4.7	4.8	2.1
Total [1]	144.4	209.5	219.7
Other commodities	305.6	527.1	779.8
Total imports	450.0	736.6	999.5

r Revised. p Preliminary.
[1] Total of listed figures only.

The most important individual mineral export items in 1967 were tungsten and iron ore, valued at $11.0 million and $6.1 million, respectively. Drastic cutbacks in purchases of South Korean galvanized sheets by the United States for use in South Viet-Nam were responsible for a sharp decline in iron and steel product exports. Imports of iron and steel scrap, used in making steel, and iron and steel semimanufactures, obtained for rolling and galvanizing, reached new highs in 1967 as domestic steel demand spiraled. Imports of petroleum and petroleum products also apparently set a record because of rapidly growing internal consumption, spurred on by Government policies favoring the use of petroleum over coal. Under the impact of a developing fertilizer industry, total imports of fertilizers, both crude and manufactured, fell to about $50 million, some 40 percent lower than in 1966.

South Korea's principal trading partners in 1967 continued to be the United States and Japan. Of South Korea's total commodity import trade approximately 31 percent, valued at $305.2 million and including large amounts of iron and steel scrap and fertilizers, and 43 percent of the commodity export trade, valued at $137.2 million, was with the United States. Of commodity imports, Japan accounted for about 44 percent valued at $443.1 million, which included substantial quantities of iron and steel products and fertilizers, but only about 25 percent of its exports, valued at $95 million and including iron ore, tungsten, lead, and zinc concentrates and various nonmetallics.

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Table 2.—South Korea: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum, unwrought and semimanufactures	203	80	Iran 40; Hong Kong 28.
Bismuth	64	84	NA.
Copper, unwrought and semimanufactures	2,936	707	South Viet-Nam 245; West Germany 214; Japan 169.
Iron ore	708,871	641,358	Japan 630,803; Taiwan 10,555.
Iron and steel:			
Powders	---	6,080	All to Japan.
Steel ingots and other primary forms	5,388	---	
Semimanufactures	60,961	33,718	South Viet-Nam 33,179.
Lead concentrates	7,090	11,772	Japan 11,528; Mexico 244.
Manganese ore	2,810	620	All to Japan.
Molybdenum concentrate	r 532	1,028	Japan 891; South Viet-Nam 54.
Monazite	e 30	97	Mostly to Japan.
Silver, unwrought and semimanufactures thousand troy ounces	9,227	322	All to United Kingdom.
Tin concentrate long tons	---	16	All to Spain.
Titanium ore	8	25	United Kingdom 20; Japan 5.
Tungsten:			
Metal	---	12	Republic of South Africa 4.
Concentrate (includes synthetic scheelite)	4,106	3,760	Japan 877; Mexico 682; Belgium 672; United Kingdom 643.
Zinc concentrates	13,914	32,174	All to Japan.
Zirconium concentrate	e 70	97	All to Japan.
Nonmetals:			
Barite	1,114	---	
Cement	54,884	24,704	Philippines 16,676; South Viet-Nam 6,258.
Diatomite	1	90	Japan 70; Hong Kong 20.
Dolomite (includes calcined)	19,712	13,205	Japan 12,805.
Feldspar	4,618	1,650	Japan 931; Taiwan 570; Philippines 109.
Flint pebbles	3,134	4,577	Japan 4,267.
Fluorspar	32,527	39,218	Japan 35,991; Taiwan 1,860.
Graphite:			
Amorphous	43,124	51,908	Japan 36,248; Australia 12,409; Taiwan 2,123.
Crystalline	5,750	4,161	Japan 3,916.
Kaolin	r 20,395	28,466	Japan 28,316.
Leucite, nepheline and nepheline syenite	16,772	11,138	Japan 10,158; Taiwan 900.
Mica	533	518	Mostly to Japan.
Quartz and quartzite	32,867	46,913	All to Japan.
Refractory clays (mostly pyrophyllite)	20,742	17,849	Mostly to Japan.
Silica sand	1,051	4,240	All to Japan.
Stone, crushed, n.e.s.	90	20,308	South Viet-Nam 19,602; Japan 506.
Talc	19,427	41,085	Japan 32,607; South Viet-Nam 1,949; Philippines 1,920.
Slag from other nonmetallic waste derived from iron and steel manufacture	11,880	8,456	All to Japan.
Mineral fuels: Anthracite	204,961	62,464	Japan 62,463.

e Estimate. r Revised.

Source: Foreign Trade of Korea, 1966. Customs Bureau, Ministry of Finance; Statistical Office of the United Nations.

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Table 3.—South Korea: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys, all forms	7,375	10,046	United States 2,542; Japan 2,421; Hong Kong 1,882.
Copper and alloys, all forms	1,104	1,152	United States 944; Japan 126.
Iron and steel:			
Scrap	77,129	195,624	United States 193,511.
Pig iron	9,252	51,227	Republic of South Africa 33,104; Japan 17,041.
Ferroalloys	424	172	Japan 167.
Steel ingots and other primary forms	13,357	57,879	Japan 57,769.
Semimanufactures:			
Shapes	13,524	38,556	Japan 33,229; Belgium-Luxembourg 2,867.
Plates and sheets	111,352	154,940	Japan 152,774.
Hoops and strips	22,653	20,170	Japan 20,169.
Rails	13,827	49,888	Japan 47,507; Belgium-Luxembourg 1,043.
Pipes, tubes and fittings	5,703	104,374	Japan 103,922.
Other	2,378	1,353	Japan 1,299.
Lead, scrap and unwrought	1,847	3,787	Japan 3,607.
Manganese ore	---	950	All from Thailand.
Mercury, 76-pound flasks	548	---	
Nickel and alloys, all forms	r 75	72	United States 57; Japan 9.
Tin and alloys, all forms, long tons	e 130	214	United States 142; Malaysia 65.
Titanium:			
Ore	44	170	All from Australia.
Dioxide	1,594	1,677	United States 1,462; Japan 181.
Zinc and alloys, unwrought and semimanufactures	8,932	6,856	Japan 4,882; Peru 1,155.
Nonmetals:			
Asbestos	6,385	12,070	United States 9,985; Canada 1,830.
Cement	6,069	177,615	Japan 177,591.
Diatomite	209	3	All from Japan.
Fertilizers:			
Crude:			
Phosphatic	---	12,190	All from United States.
Potassic	56,407	20,943	United States 20,918.
Manufactured:			
Nitrogenous	573,442	237,372	Japan 165,696; United States 71,676.
Phosphatic	283,923	339,046	United States 276,424; Morocco 29,870.
Potassic	40,496	315,360	United States 283,052; Morocco 9,924.
Other	79,001	27,533	United States 27,531.
Gypsum	41,545	71,384	Mexico 60,306; Canada 4,000; United States 4,000.
Magnesite	1,270	299	Japan 169; Taiwan 130.
Sulfur	6,467	22,040	United States 16,028; Japan 3,605; Canada 2,407.
Mineral fuels:			
Coal:			
Anthracite	17,792	1,118	All from Japan.
Bituminous	99,587	63,365	Japan 39,247; Australia 24,118.
Coke and semi-coke	17,171	27,251	All from Japan.
Petroleum:			
Crude and partly refined, thousand 42-gallon barrels	r 11,151	14,130	Mostly from Kuwait.
Refinery products:			
Gasoline, do.	25	163	All from Japan.
Distillate fuel oil, do.	789	433	Iran 275; Unspecified 118.
Residual fuel oil, do.	88	1,687	Unspecified 1,444; Japan 243.
Lubricants, do.	33	162	Japan 147; Taiwan 11.
Pitch and asphalt, do.	244	233	Japan 192; Taiwan 27.
Other, do.	5	34	Japan 21; United States 12.

e Estimate. r Revised.

Source: Foreign Trade of Korea, 1966. Customs Bureau, Ministry of Finance; Statistical Office of the United Nations; Korea Oil Company.

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COMMODITY REVIEW

METALS

Copper, Lead, Silver and Gold.—The Changhang smelter-refinery remained the focus of the nonferrous metal industry. Output of refined metals in 1967 included 3,361 tons of copper, 2,987 tons of lead, about 543,000 troy ounces of silver, and 20,287 troy ounces of gold.

The Dalsang copper-tungsten mine produced the greatest tonnage of copper concentrates (3,995) but was exceeded in terms of output value by the lower quantity but higher quality concentrates from the Kunbuk copper mine. New mills have been proposed at Kunbuk, where concentrates are presently hand processed, and at the formerly important Il Kwang copper mine north of Pusan, currently being reactivated. The Yeong Hwa lead-zinc mine of the Young Poong Mining Company, Ltd. (Young Poong) was again by far the leading producer of lead concentrates, with 9,873 tons. The projected opening in 1969 by Young Poong of a new lead-silver mine near Inchon could more than double 1967 output of silver, over 90 percent of which now comes from Changhang as a byproduct of lead smelting. Reserves at the Young Poong's new Bupyong property are estimated at 1 to 3 million tons of ore containing 330 grams per ton of silver and 3 percent lead. The Changhang smelter and the Daimyong Mining Co. were the leading suppliers of the officially recorded gold production. Total output from the more than 150 active gold mines and placer deposits, however, is estimated to be twice that reported, as producers are not legally required to report output.

Iron Ore and Steel.—The Yangyang mine, which produced 282,000 tons in 1967, remained the largest source of iron ore in South Korea. The second ranking (157,000 tons) Mulkum mine, however, was to be expanded in 1968 to virtually the same size. Investigation of the Hongchon Chaun deposit of magnetite ore, discovered in 1965, continued with core drilling and ore testing.

Consumption of iron and steel continued its 15 percent per annum rise of recent years, reaching 723,000 tons in 1967. This demand was met principally by privately owned plants which remelted imported U.S. scrap in electric furnaces.

Within last 2 years an estimated 300,000 tons per year of electric furnace steel capacity has been added. The principal steel industry addition in 1967, however, was the opening at Masan of the Korea Steel Co. plant with a steel capacity of 420,000 tons yearly. DEMAG A.G. of the Federal Republic of Germany agreed in 1967 to convert the Inchon Steel Making Co. plant at Inchon into an integrated operation through the addition of iron-making facilities. When completed, 125,000 tons annually of sponge iron will be produced from South Korea's relatively low-grade iron ore by the SL/RN process in a rotary kiln. Indigenous anthracite will be the principal fuel.

In October 1967 the Government reached a tentative agreement with Korea International Steel Associates (KISA), an international consortium of eight companies from five countries, for the development of a conventional steel mill with an initial annual capacity of 600,000 tons of crude steel. Headed by Koppers Company, Inc. of Pittsburgh, KISA is to design, construct, and probably help finance, the undertaking. At the turn of the year, however, the KISA arrangement was still rather uncertain.

Tungsten and Bismuth.—Most of the decline in output resulted from lower production at the Sangdong mine, principal source (81 percent in 1967) of mined tungsten. Output was 2,926 tons of natural and synthetic scheelite concentrates. A deep shaft sinking program was finally begun at Sangdong in order to allow deeper mining and longer term development of the mine's 16 million tons of indicated reserves of 0.70 percent WO_3, 0.06 percent MoS_2, and 0.05 percent bismuth. The daily ore treating capacity of the mine flotation mill is being expanded from 1,200 to 1,800 tons.

Most of the 1967 bismuth production also originated from the mill at Sangdong, where a sulfide concentrate averaging 25 percent bismuth was extracted. Potential for increased bismuth production at several dormant or undeveloped mines is considered good.

Zinc.—Refined zinc was produced solely at the Tongshin zinc refinery which operated at only 50-percent capacity during 1967. Vigorous expansion work was taking place at the Yeong Hwa mine which pro-

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duced 13,804 tons of zinc concentrates, half the national mine output. A 20,000-ton-per-month ore treatment plant was completed there in 1966 and plans were made for bringing an on-site zinc refinery with an annual capacity of 7,500 tons on stream in 1969.

NONMETALS

Cement.—Despite a 42-percent capacity increase, about 480,000 tons of cement had to be imported in 1967 to meet domestic requirements of nearly 3 million tons. Lagging plant completions and reluctance of producers to build inventories during slack periods were reportedly responsible for part of the shortage. Production capability was divided between five companies with as many plants, as follows: Hanil Cement Co. at Tanyang (700,000 tons); Korea Cement Co. at Mungyong (500,000 tons); Ssangyong Cement Co. at Yongwol (700,000 tons); Tan Yang Cement Co. at Chechon (400,000 tons); and Tong Yang Cement Co., Ltd., at Samchok (700,000 tons).

Fertilizer Materials.—At Ulsan, the Japanese-built plant of the Korea Fertilizer Co. started up in April with a capacity of 200,000 tons of ammonia and 330,000 tons of prilled urea. Virtually identical urea-mixed fertilizer plants, constructed by the Fluor Corp. of the United States, opened in March at Ulsan and in April at Chinhae, near Pusan. Both the Ulsan plant, owned by the Yong Nam Chemical Fertilizer Co., Ltd., and the Chinhae plant, owned by the Chinhae Chemical Co., Ltd., had a capacity of 84,000 tons of urea and 180,000 tons of mixed fertilizers. Naphtha, now imported but later to be obtained from indigenous refineries, is the principal feedstock for the two plants. As a result of these three plant completions, 10- to 15-percent reductions in the prices of most fertilizers were ordered by the Government.

Fluorspar.—Among the mines reporting fluorspar production in 1967, the Kumi, with an output of 11,494 tons, and the Changwol, with 10,559 tons, were the most important.

Graphite.—Output of the valuable crystalline graphite increased despite a heavy tariff and other restrictions placed on it in Japan. The most important of the three active mines was again Shiheung, which produced 1,700 tons.

Production of amorphous graphite, frequently extracted jointly in mines with anthracite, fell largely because of adverse conditions in the coal industry which affected the combination mines more severely. The principal mines were Wolmyong and Bongmyong, which produced 24,172 and 18,117 tons, respectively.

Kaolin.—The Tansong (13,299 tons) and Hadong (10,292 tons) were the largest of the active kaolin mines in 1967. While the single largest consumer continues to be the Japanese chinaware industry, the Government is attempting to develop these resources for internal use through the establishment of a ceramics center at Masan. Some 15 ceramics producing plants are now under construction around a beneficiation plant completed there in 1964.

Salt.—All production comes from about 30,000 acres of salterns, located principally along the west coast. Plans have been made by the Government to invest some $580,000 in improving the quality of the salt and increasing output, currently obtained by hand methods. Expected growth in demand for high-quality salt by the emerging alkali industries is the principal reason for the Government action. Two plants with a total capacity of about 100,000 tons of soda ash, as well as 45,000 tons of ammonium chloride, were believed under construction in 1967.

Silica Stone (Quartzite).—Under the impetus of growing Japanese markets, output of silica stone has risen in recent years from insignificance to become an important earner of foreign exchange. Both production and exports more than doubled between 1966 and 1967. Of the total 1967 output about 46 percent, or 97,000 tons worth $844,000, was shipped to Japan. The larger mines in 1967 included Changchon, Yanggu, Chungju, Chiyae, and Hakdong, although none accounted for as much as 10 percent of total production.

Talc.—Among the nonmetallics talc remained the largest earner of foreign currency. Exports of both milled and lump talc, about three-quarters of which went to Japan, earned $1.2 million in 1967. The largest source by far of talc remained the Tongyang mine with a 46,842-ton production in 1967.

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MINERAL FUELS

Coal.—Despite a 7-percent increase in production to 12.4 million tons, the industry experienced severe difficulties apparently associated with the Government's intentions of deemphasizing coal in national energy policy. About 7,000 of the coal mining force of 35,000 was alleged to have been laid off work, while stockpiles reportedly reached record levels. Prices set too low for profit under conditions of rising costs were blamed by private operators as the major handicap, but even the Government-owned sector of the industry was having difficulty in obtaining sufficient operating funds. Temporary alleviation was offered by the Government in the form of loans to mine operators to pay wages due to workers, an agreement to buy and stockpile as much coal as possible, a request to the Government-owned Korea Electric Corporation to increase the proportion of coal burned in its powerplants as much as possible for the time being, a rise in the number of urban areas approved for the use of coal, and consent for an increase in coal exports to Japan.

Rationalization measures continued in 1967. In eight coalfields, each yielding less than 300,000 tons annually, the privately owned mines were consolidated into single operating companies which were intended to assume greater importance in future coal production. At Changsong, the largest coal mine in South Korea and one of the eight owned by the Government's Daihan Coal Corp., work progressed on the AID-assisted project of deepening the main shaft to 650 meters. When completed in 1968 the mine will be able to produce 1.4 million tons annually.

Petroleum.—South Korea continued to rely on imported petroleum for all its liquid fuel requirements. Three test wells drilled near Pohang with a rig and crew borrowed from the Chinese Petroleum Corp. of Taiwan proved dry, underscoring the country's lack of any petroleum resources.

Recent Government decisions favoring the use of residual fuel oil over coal in powerplants and heating units were reportedly the key factors in an estimated one-third rise in petroleum consumption in 1967. All indigenously refined products continued to come from the Ulsan refinery of the largely Government-owned Korea Oil Corp. Construction was officially declared to have started on a second refinery at Yosu. Some doubt remained, however, whether this refinery, a joint venture of the Lucky Chemical Co. (connected with the Honan Oil Corp. of South Korea) and the California Texas Oil Corp. of the United States, would be completed at this site, in view of the Government's apparent decision to locate its second petrochemical complex elsewhere. Another joint venture agreement was reached between Esso International Inc. of the United States and the Hanyang Oil Co. of South Korea to establish a third refinery at an undetermined site. At all three refineries the U.S. participant is supplying crude oil under a long term contract.

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The Mineral Industry of Kuwait

By James A. West [1]

Despite a high level of crude oil production during 1966 and 1967, Kuwait relinquished its long-held position as the leading Near East area oil producer to Saudi Arabia. Nevertheless, it ranked as a major producer with an output of 2.3 million barrels per day, accounting for about 23 percent of area production and 7 percent of world crude oil production in 1967.

As in recent years, the petroleum industry in 1967 continued to provide more than 95 percent of all government revenues and foreign exchange earnings. In 1966 and 1967, government revenues from oil companies operating in Kuwait and in the Kuwait-Saudi Arabia Neutral Zone amounted to about $650 million each year. A supplemental royalty expensing agreement between the Government and the Kuwait Oil Co. (KOC) was ratified by the Kuwait National Assembly on May 2, 1967, effective retroactively to January 1, 1964. Under the agreement, royalty payments are treated as an expense for tax accounting purposes rather than as a direct reduction in tax obligation. In effect, it will increase the Government's share of oil revenues by 2 to 3 percent. In May, the Government received an estimated $109 million as a retroactive payment.

Construction of plant facilities at the Government-sponsored Shuaiba industrial area progressed satisfactorily. The Kuwait Chemical Fertilizer Cc. began production of ammonium sulfate and continued construction of related facilities to produce urea. Upon completion, these plants will have a daily capacity of 500 tons of ammonium sulfate and 550 tons of urea. Construction of the Kuwait National Petroleum Co. (KNPC) oil refinery proceeded as scheduled. Additional petrochemical and other industrial development projects remained under active consideration. Under terms of a joint venture agreement, a Turkish company will build a chemical fertilizer plant at Mersin, Turkey with Kuwait capital. This plant will be supplied with liquid ammonia from Kuwait under a long-term contract.

PRODUCTION

The trend of annual increases in crude oil output to establish record highs each successive year continued through 1967; however, disruptions caused by the Arab-Israeli War and a partial oil embargo thereafter severely limited the rate of increase in 1967. Crude oil production at an average daily rate of 2,292,400 barrels during 1967 exceeded that of 1966 by only 0.74 percent.

Construction materials and salt also were produced but quantities are not regularly reported. In 1966, available data show that 49 million sand lime bricks, 1,322 tons of lime, and 4,200 tons of salt were produced. These materials were valued at $2.7 million.

[1] Area specialist, Near East-Africa, Division of International Activities.

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Table 1.—Kuwait: Production of petroleum and petroleum products

(Thousand 42-gallon barrels)

Commodity	1963	1964	1965	1966	1967
Crude petroleum	705,471	r 774,816	791,903	830,537	836,719
Refinery products:					
Gasoline	2,167	1,625	1,901	2,668	2,673
Jet fuel	204	202	224	357	393
Kerosine	317	345	335	335	363
Distillate fuel oil	18,604	20,284	19,766	21,171	18,530
Residual fuel oil	38,419	41,455	41,878	42,270	42,228
Liquefied petroleum gas	1,774	2,886	4,030	7,969	e 8,000
Other refinery products	5,101	4,853	16,154	15,674	16,464
Refinery fuel and loss	7,483	6,457	539	491	673
Total output, including refinery fuel and loss	74.069	78.107	84.827	90.935	89.324

e Estimate. r Revised.

TRADE

In 1967, Kuwait continued as a leading world petroleum supplier, accounting for nearly 12 percent of total world petroleum exports. Oil exports from Kuwait only (excluding those from the Kuwait-Saudi Arabia Neutral Zone) amounted to 755 million barrels and were valued at an estimated $1,300 million.

Kuwait remained dependent on imports for most of its food, capital and consumer goods, including all metals and most nonmetallic minerals. The relative importance of mineral commodity trade to total trade during 1965 and 1966, the latest years for which statistics are available, is shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of tota (percent)
	Mineral commodities	Total trade	
Exports (including reexports):			
1965	1,203	1,243	97
1966	1,266	1,304	97
Imports:			
1965	31	377	8
1966	46	463	10
Trade balance:			
1965	1,172	866	XX
1966	1,220	841	XX

XX Not applicable.

In 1966, iron and steel imports were valued at $26.9 million. The leading nonmetal import was cement, valued at $12.2 million.

Table 2.—Kuwait: Exports of mineral fuels

(Thousand 42-gallon barrels)

Commodity	1965	1966	Principal destinations, 1966
Crude petroleum	710.299	750.367	Italy 184,398; United Kingdom 127,157; Japan 123,520; France 58,167; Netherlands 51,689; Australia 23,993.
Refinery products:			
Gasoline		762	NA.
Light distillate	12,164	15,499	NA.
Distillate fuel oil	18,696	19,595	NA.
Residual fuel oil	17,079	18,138	NA.
Liquefied petroleum gas	4,031	3,794	NA.
Total	51,970	57,788	NA.
Bunkers, all flags:			
Diesel oil	656	565	NA.
Residual fuel oil	24,044	24,083	NA.

NA Not available.

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Table 3.—Kuwait: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys	290	583	United Kingdom 254; Lebanon 122.
Copper and alloys	120	298	Mainland China 100; United Kingdom 67.
Iron and steel semimanufactures	133,684	191,066	Japan 43,022; Belgium 34,822; mainland China 29,618; U.S.S.R. 18,228.
Lead and alloys	106	150	Yugoslavia 90; United Kingdom 34.
Nonmetals:			
Asbestos	4,243	3,065	United Kingdom 1,286; Swaziland 1,150.
Cement	r 506,428	729,123	U.S.S.R. 246,640; Rumania 162,999; Japan 137,750; Iraq 70,611.
Gypsum and limestone	6,629	8,308	Iran 4,189; Belgium 1,581.
Marble	7,535	7,382	Italy 6,298; Iran 966.
Salt	1,133	1,400	Iran 982; United Kingdom 193.
Mineral fuels: Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	3	15	Iran 14.
Lubricants ---do---	69	104	United Kingdom 62; United States 26.
Asphalt ---do---	14	28	Iran 15; West Germany 6.

r Revised.

COMMODITY REVIEW

METALS

Iron and Steel.—The Kuwait Pipe Co. continued to produce spiral-welded pipe using imported Japanese steel. Proposals for the construction of additional plants to produce welded pipe were being considered but no new plans were announced during 1966 or 1967.

NONMETALS

Construction Materials.—The Kuwait National Industries Co., owned jointly by the Government and private investors, increased its output of sand lime bricks, concrete products, and asbestos-cement products. No firm plans were announced for the construction of the proposed 150,000-ton-per-year cement plant by the company.

MINERAL FUELS

Petroleum.—The Kuwait Oil Co. (KOC) remained as the only oil producer in Kuwait proper and its petroleum operations continued as the dominant industrial activity of Kuwait. Successful exploration and delineation well drilling resulted in a substantial upward revision of oil reserves during 1966 and 1967. Reported proved crude oil reserves as of January 1, 1968, were an estimated 70,000 million barrels,[2] an increase of 11 percent within this 2-year period.

The record oil production was from about 500 producing wells. Over 85 percent of production was from the greater Burgan Field (Burgan, Ahmadi, and Magwa). The Raudhatain field of northern Kuwait was the next largest producer. Minor quantities were produced from the Minagish, Umm Gudair, Sabriya, and Bahra fields. KOC continued the development of wells, injection plants, and producing facilities to meet increased production demands from these fields at maximum efficient rates. KOC employed five contract rigs for exploration and development drilling and one company rig on well workovers. The company's 250,000-barrel-per-day refinery operated at about 90 percent of capacity.

KNPC, the Government-controlled oil entity, continued to expand its activities in marketing, refining, and other petroleum operations. Final agreement was reached between KNPC and Hispanoil, a Spanish consortium of oil refining and banking interests, for joint oil exploration and development of concession areas previously relinquished by KOC. Construction of the modern, 95,000-barrel-per-day export refinery at Shuaiba proceeded as scheduled and is expected to begin operations in early 1968. The $100 million plant will be the only installation in the world to use hydrogen in all downstream process units. The hydrogen process results in sulfur removal

[2] Oil and Gas Journal. V. 65, No. 52, Dec. 25, 1967, p. 118.

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and maximum recovery of high-quality middle distillates.

Natural Gas.—Nearly one-fourth of the 1.1 to 1.2 billion cubic feet per day of solution gas produced with oil by KOC was utilized for industrial, injection, and related purposes. KOC increased use of gas for reservoir injection and pressure maintenance. The 50-million-cubic-foot-per-day injection plant in the Raudhatain field operated satisfactorily. Construction of the first phase of a plant in the Minagish field to inject 164 million cubic feet per day was completed and the plant was placed in operation in 1967. The Burgan injection plant was shut down throughout the year undergoing repairs.

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The Mineral Industry of Kuwait-Saudi Arabia Neutral Zone

By James A. West [1]

The Kuwait-Saudi Arabia Neutral Zone occupies a significant position among world mineral producers solely because of its large petroleum resources. In 1967, it ranked sixth among Near East oil-producing States and accounted for slightly more than 1 percent of world crude oil production. The Governments of Kuwait and Saudi Arabia received annual oil payments of an estimated $40 million each as their equal shares of oil revenues from the Neutral Zone in 1966 and in 1967. The rapid expansion of offshore oil production, important new oil discoveries onshore and offshore, and commissioning of a new refinery were the most noteworthy developments in 1966 and 1967.

By Amiri decree published on December 24, 1967, the Government of Kuwait ratified documents relating to the final demarcation of the land boundary of the Kuwait-Saudi Arabia Neutral Zone and the common boundary between Kuwait and Saudi Arabia.

PRODUCTION

Greatly expanded offshore crude oil production continued to offset declining onshore output. As compared with that of 1965, the 1966 offshore output increased by 40.5 percent to average 254,800 barrels daily while onshore production declined by 8.4 percent to 165,500 barrels per day. In 1967, offshore output exceeded that of 1966 by 11 percent but onshore production declined by 17 percent.

The completion of a 30,000-barrel-per-day refinery at Khafji in October 1966 raised the capacity of Neutral Zone crude oil processing plants to 190,000 barrels per day.

[1] Area specialist, Near East—Africa, Division of International Activities.

Table 1.—Kuwait-Saudi Arabia Neutral Zone: Production of petroleum and petroleum products

(Thousand 42-gallon barrels)

Commodity	1963	1964	1965	1966	1967 e
Crude petroleum	114,533	131,416	132,285	153,432	152,862
Refinery products:					
Residual fuel oil	27,390	28,694	31,984	30,133	26,000
Other refinery products	2,707	2,200	2,891	3,516	3,000
Refinery fuel and loss	955	910	841	778	1,000
Total output refinery products	31,052	31,804	35,716	34,427	30,000

e Estimate.

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TRADE

Exports of petroleum and refinery products, the only mineral commodities traded in the Neutral Zone, were valued at an estimated $210 million in 1966.

Table 2.—Kuwait-Saudi Arabia Neutral Zone: Exports of petroleum and petroleum products

(Thousand 42-gallon barrels)

Commodity	1964	1965	1966	Principal destinations, 1966
Crude petroleum	108,792	108,707	130,612	Japan 109,139; Italy 7,979; United States 6,806.
Refinery products:				
Residual fuel oil	17,876	16,393	16,772	NA.
Other refinery products	797	629	2,598	NA.
Bunkers, all flags:				
Distillate fuel oil	-------	-------	e 7	
Residual fuel oil	3,598	2,340	2,836	

e Estimate. NA Not available.

COMMODITY REVIEW

MINERAL FUELS

Petroleum.—The American Independent Oil Co. (Aminoil) and Getty Oil Co. (Getty) continued intensive oil exploration and development operations on their jointly owned onshore concession throughout 1966 and 1967. An important oil discovery was made in the northwest part of the concession at South Umm Gudair. The discovery well is just south of the Kuwait boundary and on the same structure as the Umm Gudair field in Kuwait. Commercial quantities of oil were found in the Ratawi limestone zone at a depth of about 9,000 feet. Delineation and development drilling of 12 wells in 1967 confirmed South Umm Gudair as a major field. Two deep tests drilled during 1966 at Hamma and Arq in the southwest corner of the zone proved noncommercial. The Wafra field continued as the main oil producer although small quantities of oil were produced from the South Fuwaris field. Nearly 80 percent of the 423 producing wells in these fields are equipped with pumping units or were awaiting workover at yearend.

Offshore, the Arabian Oil Co. Ltd. (AOC) operated one rig on development drilling in the Khafji field and completed five new wells in 1966. Two rigs were operated on development drilling throughout 1967. An exploration well drilled at Lulu in the eastern part of the concession near the median line apparently resulted in a substantial oil discovery in this area. The Lulu well reportedly tested oil in commercial quantities from the Ratawi limestone zone at a depth of about 9,000 feet. A subsequent well, the Daura 1 drilled about 10 kilometers north of the Lulu well, also discovered oil, although the new field was reported to be separated from the Lulu structure.

All oil production was from the Khafji field, which had about 50 wells connected to production facilities. Construction of new oil handling facilities was continued and installed capacity was expanded to about 300,000 barrels per day.

On October 27, 1966, AOC formally inaugurated its new 30,000-barrel-per-day refinery at Khafji. The plant produced mostly bunker fuel for tankers loading at the AOC terminal plus some light distillate for field use and export.

Reported [2] proved crude oil reserves for the entire Neutral Zone at yearend were an estimated 13.5 billion barrels.

[2] Oil and Gas Journal. V. 65, No. 52, Dec, 25, 1967, p. 118.

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The Mineral Industry of Lebanon

By John R. Lewis [1]

Lebanon's economy in 1967 continued to depend heavily upon commerce, banking, and tourism; the domestic mineral industry contributed only slightly to the national commerce, mineral resources being quite limited. About two-thirds of the national income generally comes from trade and services, while the remaining one-third is generated by the industrial and agricultural sectors, which employ two-thirds of the workers. Thirty percent of the national income is provided by trade alone.

The United States Agency for International Development (AID) estimates Lebanon's 1966 gross national product (GNP) at $1,250 million [2] with a per capita GNP of $475. About 62,000 of Lebanon's estimated population of 2.7 million persons were working directly in industry, including some 12,000 in the minerals industries, possibly more than half in petroleum—mostly refining.

The national economy suffered two severe disruptions during 1966–67. The Intra Bank, Lebanon's largest, was forced to close on October 14, 1966, and did not reopen until December 28, 1967. The Arab-Israeli disturbance of June 1967 had an even more severe effect which continued to be felt for many weeks. Tourism, providing 8 to 9 percent of the GNP and a large share of the foreign exchange, suffered heavily. Total customs receipts were L£129.1 million in 1967 against a previous year's total of L£156.7 million. Income from petroleum transit and terminaling fees was also sharply down. Although petroleum consumption rose in 1967, the growth rate was only one-third of that expected, and Government as well as private sector incomes were lagging at yearend.

The Government made efforts to broaden the economic base and spread more of the earning power beyond the confines of Beirut. Moreover, specific projects to improve the 1966–67 economic situation were set in motion. A highly publicized 5-year public works plan, begun in 1966, progressed but slowly. The ambitious Litani River development program was about on schedule. It will provide additional electric power as well as water for irrigation and urban use. To boost the throughput at Beirut's free foreign trade zone, a third transshipment facility was being built.

PRODUCTION

Despite overall economic difficulties in 1966 and 1967, the general upward trend in mineral commodity output value continued. Total mineral output in 1965 was estimated at $69 million; in 1966, it was estimated to be $75.5 million, and in 1967 $78 million.

[1] Petroleum engineer, Division of International Activities.

[2] Where necessary, values have been converted from the Lebanese pound (L£) at the rate of L£3.07=U.S.$1.00.

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Table 1.—Lebanon: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Iron and steel:					
Pig iron	600	------	------	------	------
Semimanufactures e	36,000	45,000	55,000	60,000	55,000
Nonmetals:					
Cement thousand tons	896	881	970	1,096	1,016
Dolomite	NA	NA	NA	NA	140
Gypsum	NA	NA	NA	27,000	e 30,000
Kaolin	NA	NA	NA	NA	3,000
Lime e	35,000	26,650	40,000	65,000	50,000
Salt e	19,000	20,000	24,000	25,000	30,000
Silica sand	NA	NA	NA	NA	10,000
Mineral fuels:					
Bitumen	------	------	------	------	279
Petroleum:					
Refinery products:					
Gasoline thousand 42-gallon barrels	1,655	2,034	2,405	2,628	2,572
Kerosine do	888	961	1,008	1,194	1,391
Distillate fuel oil do	1,182	1,628	1,774	1,621	2,015
Residual fuel oil do	3,118	4,408	5,136	5,977	5,791
Other, including liquefied petroleum gas thousand 42-gallon barrels	96	140	220	241	250
Refinery fuel and loss do	669	392	443	677	e 700
Total output, including refinery fuel and loss thous. 42-gallon bbls	7,608	9,563	10,986	12,338	12,719

e Estimate. NA Not available.

TRADE

Mineral commodity trade of Lebanon is heavily on the import side because of resource limitations. However, owing to the nation's strategic location athwart trade routes and the fact that it has one of the best harbors of the eastern Mediterranean, Lebanon serves as a transshipment point for mineral and other commodities being imported for neighboring States, and also has a significant role as an export terminal for Iraqi and Saudi Arabian oil. Recorded mineral exports were valued at only $10.5 million in 1966 accounting for but 10 percent of total exports value ($103 million), while mineral imports were valued at $185 million or 35 percent of total imports ($533 million).

Between 1964 and 1966, the trade deficit from mineral commodity imports rose 43 percent although the total trade deficit only rose 18 percent, reflecting the Nation's growing inability to develop on its own limited resources. Trade in gold continued to make Lebanon, in 1966, a leader among Near East gold markets; gold represented 78 percent of the value of all metals imported by Lebanon in 1966 (62 percent of all mineral commodities imported). However, an overview of imported mineral commodities reveals that receipts of the metals aluminum, copper, iron and steel, generally have increased. Iron and steel imports accounted for 19 percent by value of all metal imports; aluminum for 8.3 percent; and copper (mostly for electric wire) for 0.5 percent.

Among the nonmetallic mineral commodity imports, fertilizers (40 percent) were far in the lead, followed by marble (15 percent). Gasoline and fuel oils together represented 79 percent of all of Lebanon's mineral fuel imports in 1966. Value of imports and exports by major commodity group was as follows.

	Value (million dollars)	
	Imports	Exports
Metals	146.7	6.7
Nonmetals	10.5	3.6
Fuels	27.8	0.2
Total	185.0	10.5

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Table 2.—Lebanon: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum and alloys:			
Unwrought	175	69	Syria 39; Italy 30.
Semimanufactures	2,372	3,418	Iraq 2,284; Syria 920.
Copper and alloys:			
Unwrought	446	174	Belgium 60; United States 32.
Semimanufactures	86	166	Netherlands 49.
Gold and alloys—troy ounces	22,827	58,872	Kuwait 49,933; Greece 4,373; Saudi Arabia 1,608.
Iron and steel:			
Scrap	776	4,426	Cyprus 1,834; Italy 1,640; Belgium 735.
Pig iron	3	42	Israel 21; Syria 21.
Shot, powder, and sponge	1	------	
Ferroalloys	470	------	
Ingots and primary forms	50	30	Saudi Arabia 29.
Semimanufactures	19,075	16,651	Jordan 7,167; Saudi Arabia 2,503; Syria 1,085.
Lead:			
Unwrought and scrap	85	34	Jordan 25; Saudi Arabia 8.
Semimanufactures	122	15	Saudi Arabia 8; Jordan 4.
Platinum and alloys—troy ounces	19,708	1,768	All to United Kingdom.
Zinc and alloys: Semimanufactures	3	13	All to Israel.
Other, not elsewhere specified	580	447	Netherlands 382; Syria 59.
Nonmetals:			
Asbestos, all forms	27,558	29,036	Saudi Arabia 12,809; Libya 10,369; Syria 3,577.
Cement	39,305	18,754	Jordan 6,287 Kuwait 5,969; Saudi Arabia 1,782.
Chalk	1	7	All to Saudi Arabia.
Clays, all forms	489	1,041	Libya 285; Jordan 131; Syria 130.
Earth colors	11	12	Saudi Arabia 10; Kuwait 1; Jordan 1.
Fertilizers:			
Nitrogenous	379	479	Jordan 463; Qatar 10.
Phosphatic	10,336	14,386	Syria 8,759; Jordan 4,563; Cyprus 1,060.
Potassic	4	134	Iran 102; Jordan 30.
Gypsum	58	1,051	Saudi Arabia 896; Libya 97.
Lime	2,246	27,422	Saudi Arabia 13,421; Libya 10,906.
Salt	2	30	All to Jordan.
Sand	3,861	4,816	Syria 4,726.
Stone:			
Marble	358	116	Saudi Arabia 37; Kuwait 42; Iraq 22.
Gravel and crushed stone	599	895	Jordan 733.
Other	11	78	All to Arabian countries.
Sulfur, refined	31	69	Jordan 49; Saudi Arabia 18.
Talc	------	1	All to Arabian countries.
Mineral fuels:			
Bitumen, natural	52	37	Italy 18; Saudi Arabia 12; Jordan 4.
Coal, all ranks	1,282	959	Jordan 456; Syria 325; Iraq 151.
Coke, all types	848	811	Iraq 483; Jordan 160; Syria 133.
Petroleum refinery products:			
Gasoline—42-gallon barrels	9	------	
Gas oil and fuel oil—do	1,740	2,958	All marine bunkers.
Lubricants—do	280	406	Jordan 217; Saudi Arabia 56; marine bunkers 49.
Liquefied petroleum gas—do	11,489	11,583	Syria 11,185.
Asphalt and other—do	6	6	All to Libya.

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Table 3.—Lebanon: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Unwrought, including scrap	1,429	3,921	France 3,725; West Germany 100.
Semimanufactures	578	583	Italy 189; Netherlands 104.
Arsenic, oxides and acids	2	5	All from France.
Chromium, oxides and hydroxides	3	6	United Kingdom 3; West Germany 2; Poland 1.
Copper and alloys:			
Unwrought	23	41	Qatar 37.
Semimanufactures	537	489	Yugoslavia 173; Italy 106.
Gold and alloys:			
Unwrought—troy ounces	2,609,161	3,281,562	United Kingdom 1,814,524; Switzerland 749,434; France 403,042.
Semimanufactures—do	1,607	2,540	West Germany 1,414; Japan 418.
Iron and steel:			
Ore and concentrate	57	754	Greece 750.
Pig iron	10,868	10,371	Czechoslovakia 5,103; U.S.S.R. 2,995.
Ferroalloys	561	70	Belgium 55; Sweden 15.
Scrap and other	573	711	United States 229; Iraq 209.
Ingots and primary forms	---	1	All from West Germany.
Semimanufactures	149,846	272,795	Rumania 49,743; France 42,766; Czechoslovakia 35,715.
Lead and alloys:			
Unwrought	666	969	United Kingdom 348; Iraq 275.
Lead oxides	91	132	France 59; United Kingdom 44.
Semimanufactures	30	75	Belgium 21; Italy 15; United Kingdom 13.
Mercury—76-pound flasks	116	1,044	All from France.
Nickel, all forms	2	4	West Germany 3; France 1.
Platinum—troy ounces	9,636	3,311	United Kingdom 1,767; Netherlands 803; West Germany 643.
Silver and alloys—do	79,005	775,154	France 726,382; United Kingdom 25,560; West Germany 22,828.
Titanium oxides	721	631	Finland 189; United Kingdom 135.
Zinc and alloys:			
Unwrought and scrap	590	941	Belgium 798; Other Asian countries 101.
Oxides	67	63	France 45; West Germany 6.
Semimanufactures	90	56	Belgium 26; West Germany 12; Poland 12.
Other metals, ores and oxides	334	139	United Kingdom 57; West Germany 33.
Nonmetals:			
Asbestos:			
Crude products	3,904	4,517	Republic of South Africa 2,011; Canada 1,180; Cyprus 840.
Semimanufactures	749	430	Yugoslavia 272; United States 80.
Barite	20	7	Syria 6; West Germany 1.
Boron compounds	29	3	West Germany 2; Italy 1.
Cement	113,719	22,830	Syria 15,044; Denmark 4,760.
Chalk	1,292	1,740	France 874; Belgium 626.
Clay and clay products:			
Crude products, all forms	2,151	2,595	United Kingdom 2,062; West Germany 177.
Semimanufactures	12,247	12,448	West Germany 5,388; Italy 1,275.
Corundum, artificial	1,087	1,206	France 1,080; West Germany 75.
Earth colors	98	66	United Kingdom 18; Spain 17; Belgium 17.
Feldspar and fluorspar	632	274	Italy 200; Norway 69.
Fertilizers:			
Nitrogenous	50,807	60,286	Italy 13,210; Chile 5,745; Portugal 5,400; United Kingdom 4,944; Austria 3,796.
Phosphatic	44,566	40,368	Jordan 38,321; West Germany 1,126.
Potassic	2,131	5,643	Spain 3,000; West Germany 1,044.
Gem stones, thousand carats precious, semiprecious.	6,995	12,423	France 3,438; India 2,984; Brazil 2,568.
Graphite	106	10	All from mainland China.
Gypsum	31,613	23,980	Syria 23,110; Cyprus 849.
Infusorial earths	1,558	1,207	Jordan 1,092; United States 68.
Lime	19	11	United States 6; West Germany 5.
Magnesite	186	204	Spain 200.
Mica	32	25	United Kingdom 17; Norway 5.
Quartz	NA	3	All from Austria.
Salt	1,840	418	West Germany 376; United States 30.
Sand	749	3,010	Syria 3,002.

See footnote at end of table.

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Table 3.—Lebanon: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Stone:			
Abrasives	1,581	9,836	Greece 6,237; Syria 3,566.
Marble	22,225	22,279	Italy 16,367; Turkey 2,153.
Other dimension stone	3,161	6,486	Jordan 3,240; Syria 3,150.
Gravel and crushed stone	7,937	8,748	Italy 7,653; Jordan 662.
Other worked stone	4	14	All from Belgium.
Sulfur:			
Elemental	24,970	10,179	France 9,703; United States 397.
Pyrites, unroasted	NA	2	United Kingdom 1; Belgium 1.
Talc	229	170	Mainland China 70; India 40; Norway 32.
Mineral fuels:			
Bitumen, natural	20,703	27,137	Jordan 17,711; Italy 8,670.
Coal, all ranks	1,905	1,750	All from Belgium.
Coke, all types	10,271	3,676	All from West Germany.
Peat	8	---	
Petroleum refinery products:			
Gas- thousand 42-gallon barrels	2,310	2,573	Iraq 1,285; Saudi Arabia 1,230.
oline.			
Kerosine ---do---	326	348	Iraq 195; Saudi Arabia 151.
Gas oil and fuel oil ---do---	3,618	3,813	Iraq 2,166; Saudi Arabia 1,644.
Lubricants ---do---	76	91	United Kingdom 37; Italy 18.
Liquefied petroleum gas ---do---	89	431	Italy 188; Saudi Arabia 122.
Asphalt and other ---do---	4	5	Rumania 1; U.S.S.R. 1.
Total ---do---	6,423	7,261	

NA Not available.

COMMODITY REVIEW

METALS

Iron and Steel.—Lebanon's large iron ore resources remained undeveloped because of their low grade. Steelmaking facilities were limited to two mills that roll sheets and reinforcing rods from imported billets and other primary forms. Both mills have scrap-melting facilities, but they were not used in 1966-67 because of unprofitability.

The Lebanon Steel Mill Co., at Tripoli, operated by M. O. Ghandour and Sons, received French assistance in 1966 to expand the existing rod mill, and to add a new plant which would make profiles and T and Y shapes. Completion of the new plant, capable of producing around 60,000 tons per year, was scheduled for early in 1968. Expansion of the old mill from 75,000 to 100,000 tons annual capacity will not be completed before mid-1968. These expansions outstrip domestic demand, and it was thought that the sources of the expansion capital may undertake responsibility for disposal of the excess beyond Lebanon's shores.

The Consolidated Steel Co. of Lebanon primarily produces steel reinforcing rods from imported billets.

Much of Lebanon's steel billet in recent years has come from Eastern Europe. Late in 1966, credit was extended so as to make billet purchase less expensive, which proved helpful to the sagging Consolidated Steel Co. By mid–1967, the situation had improved and other refinancing put the company on firmer footing.

The distribution of all steel products is conducted by nonaffiliated wholesalers, and the Lebanese producers are protected by customs tariffs which amounted to 19 percent ad valorem.

NONMETALS

Cement.—When the Intra Bank closed in October 1966, construction activity began to decline. Bad weather, the Arab-Israeli war, and falling cement exports, brought the country's production and sales of cement to their lowest levels since at least 1959. By December 1967, total sales of cement were off about 13 percent from 1966, continuing a downward trend of several years' duration. Domestic sales in December 1967 were 59,037 metric tons versus 67,000 tons in December 1966. To ease unemployment, however, production was curtailed only 9 percent. Production

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for December 1967 was 55,650 tons, slightly more than half the December 1966 output of 102,000 tons. Inventories increased during 1967 by 66,000 tons. These patterns prevailed throughout 1967, directly reflecting the sharp reduction in building permits issued, particularly in Beirut.

Both of Lebanon's cement plants, Cimenterie National and Société des Ciments Libanaise, are located at Chekka, south of Tripoli on the Mediterranean coast. In the middle sixties, expansion at both plants raised overall annual capacity to about 1,150,000 tons. A third plant authorized in 1964 for Siblin in southern Lebanon has not been built. For most of 1967, the largest plant, Société des Ciment Libanaise, had two of its four furnaces in operation.

In anticipation of a possible domestic consumption slump, Cimenterie National built port facilities so that it could export. Closure of the Suez Canal made sales beyond the canal impossible but some 20,000 tons were shipped to Libya during 1967 until Libya returned to Eastern European sources at $1.60 per ton less cost. The higher Lebanese cement price is tied to a Government-set price for fuel oil, about twice the established world price, at which the plants must buy. In order to compete in world markets, both companies have asked the Government for relief through arrangements to buy fuel oil at the lower world price, but no action had been taken by yearend on this request.

Fertilizer Materials.—Esso Mediterranean, Inc. (Standard Oil of New Jersey), and a Lebanese firm, Elie J. Doumet, SAL., formed Esso Fertilizer Co., SAL., during the midsixties. This company built a 140,000-ton-per-year nitrogenous fertilizer plant at Ras Salaata, north of Beirut, at a cost of $7 million. When fully operative early in 1967 the plant employed some 200 people. Lebanese annual demand for nitrogenous fertilizers runs around 70,000 tons.

Other Minerals.—In 1967, production of dolomite, kaolin, and silica sand was reported for the first time. It is likely that production began before 1967, as the reports indicated expanded output of these materials to meet needs in the domestic economy. No information is available as to the origin of production nor its value.

Salt is produced seasonally by individual operators, by solar evaporation of sea water.

Although there are phosphate deposits in Lebanon, no plans for their exploitation have been announced.

MINERAL FUELS

Petroleum.—Through yearend 1967, no commercial oil deposits had been found in Lebanon. Concessionaires continue sporadically to wildcat, especially in northern Lebanon. Because of Lebanon's strategic location, however, revenue created by oil transshipment continued to be an important part of total national income. Pipelines from Iraq and Saudi Arabia bring crude to Lebanon's Mediterranean transshipment terminals. Two refineries process a small part of total imported crude to meet about half of domestic requirements for petroleum products while the great share of the crude leaves Lebanon for other consuming countries. The remaining domestic product demand is met by imports, mainly from Italy in 1965–67. All lubricants are imported from the United Kingdom, United States, or Italy. Because Iraq Petroleum Co. (IPC) put a new bitumen (asphalt) plant on stream in December 1967, it is expected that imports of this product will dwindle. Some aviation gasoline and jet fuel also is imported. About the only product which is exported is a distress oversupply of fuel oil (marine bunkers), and this is rather sizable—almost 3 million barrels in 1966. This export went mostly to European countries although significant amounts at times also were shipped to Africa.

Pipelines.—Two major crude pipelines traverse Lebanon. Trans-Arabian Pipeline Co. (TAPline) brings crude from Saudi Arabia to the Zahrani export terminal at Sidon on Lebanon's southern Mediterranean coast. It also delivers crude to the Sidon refinery of the Mediterranean Refining Co. The IPC pipeline brings crude from Iraq oil fields to the Tripoli terminal in northern Lebanon, as well as to IPC's Tripoli refinery.

The unsettled situation in 1966–67 upset pipeline operations with resultant reduced revenues to Lebanon. Substantial upward adjustments in transit and ter-

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minal fees should take up some of this shortfall in 1968 and beyond. These increased fees were imposed by Lebanon in line with those agreed upon by the IPC pipeline and the Syrian Government during 1966 and 1967.

TAPline's enforced shutdown from June 6 to September 16, 1967 (Arab-Israeli crisis), resulted in a 28-percent decline in throughput at the Zahrani terminal (120.8 million barrels in 1967; 168 million barrels in 1966). This in turn, reduced Lebanon's transit terminal and loading revenues from TAPline by slightly more than $1 million, or 30 percent under the 1965 and 1966 fees paid. In 1967, the amount of TAPline crude moved out of Lebanon via tanker dropped 30 percent under 1966 shipments (1967—113.3 million barrels; 1966—162.6 million barrels).

TAPline's throughput capacity is about 460,000 barrels per day. The advent of larger tankers and increasingly higher fees charged by all countries through which the pipeline passes tends to foretell the end of its economic justification.

IPC's pipeline was shut down because of a dispute with the Syrian Government for the first 2 months of 1967 and because of the Arab-Israeli crisis, from June 7 to June 27, 1967. In spite of these curtailments, total 1967 throughput to the Tripoli terminal was 112.4 million barrels, less than 1 percent below the 1966 receipts. Total crude exports by IPC from Tripoli in 1967 lagged only 1 percent behind 1966 (1967—106.8 million barrels; 1966—107.6 million barrels). IPC's payments to Lebanon declined by only about $50,000 in 1967 because upward payment adjustments virtually balanced throughput reductions.

Refining.—A total of more than 6 million barrels of 36° to 37° API gravity crude were delivered by IPC to its Tripoli refinery in 1966. In December 1967, the rated crude capacity of this facility was 23-000 to 25,000 barrels daily. When normal pipelined crude supplies were cut off in 1966 and in 1967, the refinery operated without shutdown or curtailment, using crude in storage or Persian Gulf crude fed to it from tanker shipments.

The IPC refinery in 1966 processed 825,967 metric tons of crude. Yields, in percent of total processed, were motor gasolines—19.4; kerosine—12.2; gas oil—13.5; fuel oil for inland consumption—28.5; fuel oil for export—21.5, LPG—1; refinery fuels and losses—4.9.

The Sidon refinery is operated by the Mediterranean Refining Co. (MEDRECO), owned in equal shares by the California Texas Oil Corp. and the Mobil Oil Corp. A plan late in 1967 to expand daily crude capacity from about 17,500 barrels to about 25,000 barrels in order to keep pace with Lebanon's demand for motor fuel may be held up because of negotiations between the refinery management and the Government over proposed increased taxes and other financial arrangements.

MEDRECO, which normally processes TAPline-delivered crude, was able to maintain operations using crude stored in Lebanon during TAPline's shutdown, and there was no cutback in output.

The MEDRECO refinery, in 1966 processed 835,271 metric tons of crude. Yields, in percent of total processed, were motor gasolines—18.4; kersosine—6.3; gas oil—12.6; fuel oil for inland consumption—16.1; fuel oil for export—40.6; LPG—1.3; refinery fuels and losses—4.7.

Serious discussions took place in 1967 between French and United States interests and the Lebanese Government with respect to possible construction of a third "national Lebanese" refinery which would use crude from sources other than Iraq or Saudi Arabia. Commitments were not finalized.

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The Mineral Industry of Liberia

By Henry E. Stipp [1]

Liberia's mineral industry continued to contribute substantially to the nation's economy in 1967 with a mineral output value equal to 60 percent of the estimated Gross National Product of $219 million. Production of mineral commodities in 1967 were valued at almost $132 million [2] compared with $113 million in 1966. Iron ore continued to be the principal mineral commodity produced; the country ranked third among world exporters. Diamond exports also contributed to the nation's foreign exchange earnings.

Probably the most important event in the mineral sector was the completion at yearend of the first iron ore pelletizing plant on the African Continent. The Liberian and U.S. Geological Surveys continued joint mapping activities scheduled for completion by 1972. Objectives of the program, initiated in 1964, were chiefly to prepare a geological map of Liberia on a scale of 1:250,000, to prepare larger maps for mineral exploration, and to evaluate and make recommendations for development of the nation's mineral resources. The Government granted exclusive mineral exploration rights in South-East Liberia between the Cestos and Cavalle Rivers to a Dutch consortium, William Mueller and Co.

PRODUCTION

Iron ore mining experienced another record high year, despite a lower unit value and generally slack demand in the world market. Production in 1967 was valued at $121.5 million compared with $108.2 million in 1966. Increased output from the Mano River mine of National Iron Ore Co. (NIOC) and the Bong mine of German Liberian Mining Co. (DELIMCO) was chiefly responsible for the rise. Gold output, as indicated by Bank of Monrovia purchases (gold sales to local jewelry makers are not reported), increased 17 percent compared with 1966 levels. During the last 2 years gold production has shown a significant rise, although output is still far below the 1943 high of 30,000 ounces. Diamond shipments decreased slightly from those of 1966. Production figures for diamonds are not recorded; the largest part of diamond shipments from Liberia originate in neighboring countries.

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted to U.S. dollars at the rate of Liberian $1=U.S.$1.

Table 1.—Liberia: Production of mineral commodities

Commodity [1]		1963	1964	1965	1966	1967
Metals:						
Gold [2]	troy ounces	1,960	1,824	1,701	4,351	5,111
Iron ore	thousand metric tons	7,520	12,999	15,959	16,859	18,224
Nonmetals:						
Diamond: [3]						
Gem	thousand carats	240	298	277	343	362
Industrial	do	508	273	263	212	181
Total	do	748	571	540	555	543

[1] In addition to commodities listed, construction materials also were produced but output data are not available.

[2] Purchases by Bank of Monrovia.

[3] Exports for fiscal year ending August 31.

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TRADE

Liberian exports of mineral commodities consisted essentially of iron ore valued at almost $156 million in 1966 compared with $96 million in 1965, and diamond valued at about $4.3 million in 1966 contrasted with almost $1.4 million in 1965. Major imports were iron and steel semimanufactures valued at about $3.6 million in 1966 and almost $4 million in 1965, and petroleum refinery products valued at almost $3.3 million in 1966 and about $3.5 million in 1965. The relationship of mineral commodity trade to trade in all commodities is shown in the following tabulation:

	Value (million dollars)		Minerals commodities' share of total (percent)
	Mineral commodities [1]	Total trade [2]	
Exports:			
1965	159.4	214.8	74.2
1966	171.8	227.7	75.5
Imports:			
1965	9.3	580.3	1.6
1966	8.4	453.7	1.9
Trade balance:			
1965	+150.1	−365.5	XX
1966	+163.4	−226.0	XX

XX Not applicable.

[1] Values given are for only those commodities listed in table 2 of this chapter.

[2] Source: Statistical Office of the United Nations. Supplement to the World Trade Annual. V. 3, 1966 pp. 709–722.

Table 2.—Liberia: Foreign trade in mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations and sources, 1966
EXPORTS			
Metals:			
Iron and steel scrap	3,766	[1] 1,756	Japan 1,062; Italy 694.
Iron ore and concentrate thousand metric tons	15,668	16,272	West Germany 6,251; United States 3,359; Italy 1,618.
Nonferrous metals, scrap	172	214	West Germany 112; Japan 73; Spain 29.
Nonmetals:			
Diamond: [2]			
Bort and industrial carats	262,850	212,226	Belgium-Luxembourg [e] 197,650; United States [e] 10,940.
Gem do	276,574	342,731	Belgium-Luxembourg [e] 130,710; West Germany [e] 110,660; United Kingdom [e] 51,860.
Total	539,424	[2] 554,957	
IMPORTS			
Metals:			
Aluminum	[1] 62	[1] 98	United Kingdom 51; United States 47.
Copper	[1] 36	[1] 13	All from United States.
Iron and steel	[1] 15,685	[1] 12,913	United States 6,357; Belgium-Luxembourg 2,496; West Germany 1,965.
Nonmetals:			
Asphalt, natural	3,840	NA	
Cement and building products	46,158	[1] 41,741	Belgium-Luxembourg 9,647; Sweden 8,606; West Germany 7,778.
Fertilizers, all types	[1] 2,525	[1] 3,281	France 2,850; West Germany 431.
Salt	3,429	1,590	All from West Germany.
Nonmetallic minerals, crude, n.e.s	4	885	United Kingdom 754; West Germany 131.
Mineral fuels: Petroleum:			
Crude and partly refined 42-gallon barrels	17	NA	
Refinery products:			
Gasoline, motor and aviation do	557,184	[1] 247,240	Italy 233,657.
Kerosine and jet fuel do	83,855	[1] 164,750	All from Italy.
Distillate fuel oil do	735,848	[1] 298,758	Italy 291,626.
Residual fuel oil do	313,590	[1] 207,179	Greece 88,864; Spain 74,619; France 43,696.
Lubricating oils and greases do	5,215	12,768	United Kingdom 1,648.
Total do	1,695,692	[1] 930,695	

[e] Estimate. NA Not available.

[1] Source: Statistical Office of the United Nations. Supplement to the World Trade Annual. V. 3, 1966, pp. 709–722.

[2] Shipping figures for the Liberian fiscal year, September 1, 1965, to August 31, 1966. Figures for 1966 calendar year are unavailable.

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COMMODITY REVIEW

METALS

Iron Ore.—Production and exports continued to increase as all four mining companies experienced another good year. Output in 1968 was expected to rise to more than 20 million tons compared with 18.2 million tons in 1967. This conjecture was based upon an expected increase of 2 million tons representing a full year's production of iron ore pellets from the new $54 million pelletizing plant completed at Buchanan in November. The plant, owned by Liberian American-Swedish Minerals Co. (LAMCO), is the first to be constructed in Africa, and output consists of washed lump ore, washed fines, and pellets. These are more competitive products than the run-of-mine ore previously shipped. The capacity of the pelletizing plant was reported as about 2.2 million tons per year. In the year ending December 31, 1967 LAMCO produced 8,194,882 tons of iron ore consisting of 2,868,213 tons lump ore and 5,326,669 tons fines. Exports by LAMCO totaled 7,759,350 tons chiefly to West Germany (2,772,045), United States (2,501,860), and Belgium-Luxembourg (1,116,480). The Mount Nimba deposit mined by LAMCO was estimated to have total reserves of 250 million tons of high-grade hematite ore averaging 65 to 69 percent iron.[3] A considerable quantity of low-grade ore also occurs.

National Iron Ore Co. (NIOC), which mines a deposit on the Mano River 144 kilometers northwest of Monrovia, produced 3,748,309 tons of ore in 1967. This consisted of 1,402,145 tons of lump ore and 2,346,164 tons of fines. Exports in 1967 totaled 4,159,760 mainly to United Kingdom (1,224,784), West Germany (1,066,577), and Netherlands (710,332). Estimated reserves at the Mano River mine were 54 million tons averaging 53 percent iron and substantial quantities of low-grade ore.[4]

German Liberian Mining Co. (DELIMCO), which exploits the Bong mine 80 kilometers northeast of Monrovia, produced 3,408,779 tons of ore concentrates in 1967. Exports by DELIMCO, which totaled 3,304,083 tons, went to West Germany (2,091,284) and Italy (1,212,799). Reserves at the Bong mine were estimated at 250 million tons of ore averaging 35 to 45 percent iron.

Liberia Mining Co. (LMC), which mined a deposit in the Bomi Hills 80 kilometers northwest of Monrovia, produced 2,871,571 tons of ore in 1967. Output consisted of 1,056,404 tons lump ore and 840,772 tons of fines. Exports by LMC totaled 2,028,414 tons mainly to United Kingdom (464,600), West Germany (441,914), Netherlands (420,134), and United States (369,580). Proven reserves at the Bomi Hills deposit were reportedly 50 million tons of magnetite ore containing 68 to 70 percent iron and 150 million tons of low-grade ore containing 35 to 50 percent iron.[5]

Employment at the Mano River mine, Bomi Hills mine, and loading facilities in Monrovia totaled 1,728. The Bong mine employed 1,500 Liberians and 300 Europeans. Employment at LAMCO's facilities was estimated at 3,814 workers and staff.

A fifth iron ore mine and ancillary facilities was approved in September for installation at Kitoma.[6] Iron ore deposits at Kitoma have been estimated at 750 million tons of ore averaging 40 to 60 percent iron. The Kitoma Mining and Trading Co. an affiliate of Hanna Mining Co. and Landberg Thalman and Co. of New York was scheduled to develop the deposits at a cost of about $200 million.

The geological investigation of iron ore deposits in the Bie Range in Grand Cape Mount County being conducted by Liberia Mining Co. was said to be encouraging.[7] It was assumed that a joint-venture company, to include the Liberian Government, Mines Management Associates Ltd., and the Liberia Mining Co. (LMC), would be formed to develop the deposits.

Reportedly, hundreds of millions of tons of high-grade iron ore averaging more than 59 percent iron have been discovered in the Wologisi Range, Lofa County, about 230 kilometers northeast of Monrovia.[8] The Liberian Iron and Steel Corp.

[3] Jones, A.E. Nyema, Mineral Resources of Liberia. Mineral Inf. Service. V. 20, No. 2, February 1967, pp. 18–21.
[4] Skillings' Mining Review. V. 57, No. 32, Aug. 10, 1968, pp. 1, 4–5, 8.
[5] Mining Annual Review (London). Liberia. May 1968, p. 322.
[6] U.S. Department of Commerce, Overseas Business Reports. OBR 68–27, March 1968, p. 10.
[7] Work cited in footnote [3].
[8] The Japan Commerce Daily. V. 8, No. 78, Apr. 26, 1968, pp. 3, 7–9.

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(LISCO) has obtained a 70-year concession, and an international consortium, headed by E.J. Longyear Co., is conducting a detailed geological survey of the deposit. Plans were being prepared for development of the deposit and construction of railway and port facilities at Robertsport.

NONMETALS

Barite.—Six barite veins were discovered in a 5,180-hectare area in eastern Montserrodo County and southwestern Bong County 85 kilometers northeast of Monrovia.[9] In addition seven other occurrences were discovered later in the Gibi area of Liberia. Geologic investigations and detailed maps of the original six veins were made by the Liberian and U.S. Geological Surveys. Samples indicated that the barite was 99-percent barium sulfate ($BaSO_4$). Reserves of the six original veins reportedly exceed 1 million tons.

Diamond. — Mining operations were centered in parts of Nimba, Lofa, and Grand Cape Mount Counties.[10] The Liberian Swiss Mining Corp. operated in an area 96 kilometers north of Monrovia. Although a small quantity of diamonds was produced from Liberian resources, the greater part of diamond shipments from the country consisted of stones originating in neighboring countries and sold to licensed buyers in Monrovia.

MINERAL FUELS

Petroleum.—Petroleum activity during 1967 was confined to refinery construction and mapping sedimentary rocks near the coast by the Liberian and U.S. Geological Surveys.[11] The extent and thickness of these rocks seaward was being investigated by an aerial magnetometer and scintillometer survey.

A 10,000-barrel-per-day refinery was nearing completion 8 kilometers northeast of Monrovia.[12] The plant, owned by Liberia Refining Co., a partnership of Sunray DX Oil Co. and Hydrocarbon Research Inc., was scheduled to begin operating in July 1968.

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[9] Republic of Liberia, Geological Survey. Barite Veins in the Gibi Area of Liberia. Bull. 1, August 1967, 23 pp.
[10] Work cited in footnote [3].
[11] American Association of Petroleum Geologists Bulletin. V. 52, No. 8, August 1968, pp. 1531–1532.
[12] World Petroleum. V. 39, No. 6, June 1968, p. 8.

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The Mineral Industry of Libya

By Eugene R. Slatick [1]

The principal mineral developments in Libya in 1967 were in the petroleum industry, which continued to be of world significance because nearly all of the country's large crude oil production continued to be exported. Petroleum remained the basis of Libya's economy, and presumably made as significant a contribution in 1967 as it did in 1965, the year of the most recent complete economic data. In that year the gross domestic product was reported at $1,142 [2] million, of which the petroleum sector contributed $672 million directly and $277 million indirectly. Approximately three-fourths of all government revenue in recent years has been from the petroleum industry. In 1966 government petroleum revenues were reported at $476 million, compared with $371 million in 1965; the Government received 87.0 cents per barrel of crude oil exported in 1966, compared with 83.8 cents in 1965.[3] U.S. direct investment in Libya at the beginning of 1966 was reported at $424 million, mostly in petroleum. In 1966 the petroleum industry employed an estimated 13,500 persons, including about 10,500 Libyans.

Highlights of 1967 included the discovery by Occidental of Libya, Inc., of three oilfields, one of which reportedly is the largest in the country; the construction of Libya's sixth pipeline and an export terminal at Zuetina; the temporary halting by the Government of all crude oil production and exports because of the Arab-Israeli War; the temporary suspension by the petroleum companies of crude oil discounts; the placing on stream of the Marsa el-Brega refinery; the beginning of construction of the world's largest natural gas liquefaction plant at Marsa el-Brega; the renewal of exploration for oil in western Libya; the inauguration of the country's first aluminum fabrication plant; and an agreement to build the country's first sulfur extraction plant.

PRODUCTION

Data on mineral production for 1967 were available only for crude oil, the country's major mineral commodity. These preliminary data indicated a 15-percent increase in output relative to that of 1966 despite a 1-month production stoppage during the Arab-Israeli War. Libya continued to be the principal oil producer in Africa and apparently was the seventh largest in the world. Natural gas production, all associated with crude oil output was estimated at 415 billion cubic feet in 1967.

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[1] Foreign mineral specialist (petroleum), Division of International Activities.

[2] Where necessary, values have been converted from Libyan pounds (£L) to U.S. dollars at the rate of £L1=US$2.80.

[3] Petroleum Press Service. V. 34, No. 7, July 1967, p. 246.

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Table 1.—Libya: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Nonmetals:					
Brick----------million bricks--	e 10	e 10	e 10	NA	NA
Gypsum----------	----------	400	1,865	2,500	NA
Lime----------	NA	NA	NA	40	NA
Natron----------	----------	5	----------	----------	NA
Salt----------thousand tons--	19	12	12	(1)	NA
Stone, crushed----------do----	e 250	e 250	e 250	NA	NA
Mineral fuels:					
Natural gas, associated [2] million cubic feet--	----------	e 231,200	303,433	361,247	e 415,000
Petroleum, crude thousand 42-gallon barrels--	167,786	315,660	445,374	r 552,712	p 633,275

e Estimate. p Preliminary. r Revised. NA Not available.
[1] Less than ½ unit.
[2] Mostly flared; some used as fuel in oilfield operations.

TRADE

Libya's mineral exports have been dominated by crude oil, shipments of which reached an estimated 610 million barrels in 1967, 11.5 percent greater than that of 1966. According to preliminary data, Libya in 1967 ranked seventh in the world among crude oil exporters. Based on posted prices, the value of 1967 crude oil exports was estimated at $1 billion, compared with $983 million in 1966. Preliminary 1967 trade data indicate that the temporary interruption in crude shipments during the Arab-Israeli War had little effect on Libya's balance of trade, and that the continued large exports maintained a favorable trade balance of the same magnitude as in 1965 and 1966. Data for these years follow:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total commodities	
Exports:			
1965--------	786	r 790	r 99.5
1966--------	984	987	99.7
Imports:			
1965--------	56	320	17.5
1966--------	65	405	16.0
Trade balance:			
1965--------	+730	+470	XX
1966--------	+919	+582	XX

r Revised. XX Not applicable.
[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.

Crude oil exports during the year were from four terminal ports: Marsa el-Brega, Ras es-Sidr, Ras Lanuf, and Tobruk. A fifth terminal, Zuetina, was under construction.

Principal mineral imports in 1966 based on value were iron and steel (mainly tubes, pipes, and fittings), $24.9 million; petroleum products, $15.6 million; cement, $8.8 million; nonrefractory bricks, tiles, pipes, and similar products, $4.5 million; and nonferrous metals, $3.8 million. The petroleum companies imported supplies and equipment valued at $39.6 million in 1966, down from $61.2 million in 1965 and $78.8 million in 1964. The decline reflects the change in emphasis from exploration and development to production.

The major sources of Libya's 1966 mineral imports were Italy, $26.2 million; France, $6.4 million; United States, $5.4 million; United Kingdom, $4.9 million; and West Germany, $4.5 million.

Libya's reexports of mineral commodities were valued at $0.1 million in 1966, compared with $0.2 million in 1965 and $0.9 million in 1964.

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Table 2.—Libya: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Exports: Metals:			
Iron and steel:			
Iron ore, concentrates	40	-------	
Iron and steel scrap	4,472	8,395	Italy 8,330.
Nonferrous scrap	1,495	1,056	Italy 771; West Germany 84; Japan 83.
Mineral fuels: Petroleum, crude. thousand 42-gallon barrels	442,629	547,351	West Germany 188,312; United Kingdom 75,970; Italy 65,692; France 64,216.
Reexports: Metals:			
Copper and alloys, unwrought	-------	19	All to Italy.
Iron and steel semimanufactures	697	222	Turkey 70; France 65; West Germany 48.
Nonferrous scrap	53	-------	
Nonmetals: Clay	40	-------	
Mineral fuels: Petroleum refinery products:			
Lubricating oil, greases	-------	48	NA.

NA Not available.

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Table 3.—Libya: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys, all forms	1,100	1,793	Italy 1,197; United Kingdom 202.
Copper and alloys, all forms	165	1,361	Kuwait 756; West Germany 350.
Iron and steel:			
Iron ore and concentrate	1,041	-------	
Scrap	406	824	United Kingdom 812.
Ingots and other primary forms	2,398	1,645	Italy 1,085; Belgium-Luxembourg 478.
Semimanufactures:			
Pipes, tubes, and fittings	82,633	64,654	United States 12,351; Italy 16,433; West Germany 8,834.
Other	43,273	55,060	Italy 31,745; Belgium-Luxembourg 10,464; West Germany 8,380.
Lead and alloys, all forms	219	271	Netherlands 112; West Germany 61; Tunisia 29.
Silver:			
Ore and concentrate	821	-------	
Unworked or partly worked. troy ounces	164,515	-------	
Tin and alloys, all forms long tons	21	62	West Europe 20.
Zinc and alloys, all forms	631	452	Italy 285; Belgium-Luxembourg 118.
Nonmetals:			
Abrasives:			
Natural, crude	2,573	10,183	Italy 10,180.
Grinding and polishing wheels and stones	623	71	Italy 45; West Germany 13.
Asbestos:			
Crude	NA	27	United States 20.
Asbestos cement building materials	13,041	11,745	Italy 4,134; Yugoslavia 3,144; Czechoslovakia 1,755.
Borates, natural	550	-------	
Bricks, tiles, etc	69,548	126,595	Italy 103,245; Tunisia 14,144.
Cement thousand tons	473	620	Rumania 136; Greece 129; Italy 117.
Clays do	58	32	Greece 21; Italy 9; France 2.
Fertilizer materials:			
Crude	3,413	355	Netherlands 350.
Manufactured	12,451	21,960	Italy 11,502; West Germany 4,415; Netherlands 3,663.
Gypsum and plaster	281	1,007	West Europe 989.
Lime	24,743	44,013	Italy 32,032; Lebanon 7,058.
Limestone	431	2,657	Italy 2,017.
Mica, worked	28	208	Italy 207.
Pigments, mineral	212	151	West Europe 132.
Salt	NA	104	United States 103.
Stone, sand and gravel:			
Dimension stone	8,207	13,612	Italy 13,074.
Gravel and crushed stone	9,179	11,001	Italy 9,411; Greece 1,127.
Sulfur	NA	26	All from Italy.
Talc and steatite	NA	55	All from Italy.
Other:			
Quartz, mica, feldspar, fluorspar, cryolite, and chiolite	129	304	Ceylon 134; India 118.
Slag and other metallurgical wastes, not metal bearing	42	-------	
Mineral fuels:			
Asphalt, natural	2,621	14,479	Venezuela 6,394; Italy 5,004; United Kingdom 1,837.
Coal and coal products	6,750	-------	
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	876	942	Italy 468; France 461.
Kerosine and jet fuel do	325	606	France 304; Italy 290.
Distillate fuel oil do	1,040	1,513	Italy 1,079; France 383.
Residual fuel oil do	222	401	Italy 340.
Lubricants do	66	71	France 21; Italy 16; United States 15.
Asphalts, wax and bitumen do	137	47	Italy 24.
Liquefied petroleum gas do	48	63	Italy 55.
Total do	2,714	3,643	

NA Not available.

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COMMODITY REVIEW

METALS

Aluminum.—Libya's first aluminum fabricating plant, near Tripoli, was inaugurated in January 1967. Initially the $300,000 plant will manufacture aluminum window and door frames for the country's booming construction market. Known as ALCOLIB, the plant is jointly owned by the Aluminum Company of America (Alcoa) and a group comprised of United States, Nicaraguan, and Libyan interests. Alcoa equipped and is the operator of the plant, the third such facility that it has established in North Africa.

NONMETALS

Cement.—No further information was released during the year regarding plans of the Libyan Cement Company to build a second cement plant in Libya. The two areas considered for the plant site were Guarcia-Ghar Yunis, 8 kilometers south of Benghazi, and El-Regima, 32 kilometers east of Benghazi; both have suitable limestone deposits. The only existing plant, owned by National Cement Company, is near Homs, Tripolitania.

Sulfur.—Esso Standard Libya, Inc., agreed to build Libya's first sulfur extraction plant in return for governmental approval to acquire an interest in four petroleum concessions in western Libya. The plant willl operate in conjunction with the Marsa el-Brega natural gas liquefaction plant and will produce 45,000 long tons of sulfur yearly. The cost of the plant has been estimated at up to $2.5 million.[4]

MINERALS FUELS

Petroleum and Natural Gas.—Libya's proved crude oil reserves in 1967 were estimated at 29.2 billion barrels,[5] up from 20 billion barrels in 1966. They were the largest in Africa and accounted for 7 percent of the world's total.

Crude oil production during the first 6 months of 1967 averaged 1.6 million barrels per day, but by yearend had reached an average of 2.2 million barrels per day. Average yearly production was 1.7 million barrels per day. In mid-1967, 734 wells were producing (515 flowing, 219 pumping); 125 wells were shut in.[6]

Provisional data on daily production by company during the year was as follows, in thousands of barrels: Oasis Oil Company of Libya, Inc., 630; Esso Standard Libya, Inc., 465; Mobil Oil Libya, Ltd./Gelsenberg Benzin, A.G., 205; British Petroleum Exploration Company/Nelson Bunker Hunt, 160; Esso Sirte, Inc., 135; American Overseas Petroleum, Ltd., 130; Pan American Libyan Oil Company, 5; and Phillips Petroleum Company of Libya, 5.

In 1967 production was from 28 fields, two more than in 1966. The major fields in 1966 and their total output in thousands of barrels, were Zelten (Esso Standard), 160,052; Gialo (Oasis), 106,711; Waha (Oasis), 53,620; Dahra (Oasis), 44,554; Raguba (Esso Sirte), 34,956; and Amal (Mobil/Gelsenberg), 30,864.[7] Preliminary data indicate that these fields continued to be Libya's major producers in 1967.

The Libyan Government halted crude oil production and exports for 27 days beginning June 7 during the Arab-Israeli War; an embargo on oil exports to the United States, United Kingdom, and West Germany continued for a few months after exports to other countries were permitted.

In November 1967, oil companies exporting crude agreed to temporarily suspend, retroactive to July 1, the 6½ percent discount allowance for tax purposes granted by the Government on posted prices. This was done because the closing of the Suez Canal gives Libyan crude oil a freight advantage over oil from the Middle East. The agreement is to continue as long as the Canal is closed, and reportedly will give Libya an additional $65 million in petroleum revenue annually. Discussions were held in 1967 regarding the gradual reduction and eventual permanent elimination of such tax allowances.

In September 1967 the Libyan Government approved the acquisition by Esso Standard Libya, Inc., of a 50-percent interest in four concessions in western Libya: Concession 66 of Gulf Oil Company of Libya and Concessions 23, 49, and 61 of Compagnie des Petroles Total (Libye). In return, Esso agreed to build a sulfur ex-

[4] Petroleum Intelligence Weekly. Sept. 18, 1967, p. 7.
[5] Oil and Gas Journal. V. 65, No. 52, Dec. 25, 1967, p. 119.
[6] Page 130 of work cited in footnote 5.
[7] The American Association of Petroleum Geologists Bulletin. V. 51, No. 8, August 1967, pp. 1576–1577.

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traction plant at Marsa el-Brega. Under the agreement, Gulf and Total are entitled to dispose separately of their 50-percent share of any oil produced.

In May 1967 Pantapec International Petroleum, Ltd., a Bermudian company, obtained 20-percent interest in Concession 118 of American Mining and Exploration Company. Pantapec is slated to invest $3.5 million in exploration and development in the area before December 31, 1970.

Exploration and Development.—Occidental of Libya, Inc., discovered three more oilfields in 1967, making a total of four discovered since obtaining two concessions in 1966. The 1967 discoveries are in Concession 103, the 1966 (Augila) in Concession 102. The Idris field, discovered in May 1967, and reportedly the largest in the country was being readied for production in January 1968 at an initial rate of 150,000 barrels per day. According to preliminary plans, 18 wells are to be drilled in the field.[8] Idris crude oil has a high gravity (43° to 45° API), a low-sulfur content (0.18 percent to 0.24 percent), and a low-wax content (pour point 10° to 25° F.).[9]

The two other discoveries, C-1 and D-1, were tested at daily outputs of 3,650 barrels and 74,867 barrels, respectively. The former tested only part of the producing zone; the latter tested a 700-foot section at 8,949 feet and reportedly was the most prolific well completed in the country. The Augila field, with eight wells completed, was tested at about 100,000 barrels per day and is expected to be producing in late 1968, after a spur line is built to the Idris field pipeline. Proved recoverable reserves in Concession 103 have been estimated at a minimum of 3 billion barrels.[10]

Two other companies discovered oil during the year: British Petroleum in Concession 80 and Elwerath-Wintershall in Concession 97.

In December, Esso Standard Libya, Inc., began drilling a well in Concession 1 in western Libya to reevaluate the prospects of the area. The well is near the Algerian border, about 60 kilometers southwest of Atshan field.

Transportation and Terminals.—In 1967 Libya had five operating crude oil pipeline systems, totaling 2,228 kilometers in length and having a daily throughput capacity of 1.8 million barrels. The daily capacity of the 273-kilometer, 30-inch line from the Amal and Nafoora fields to Ras Lanuf was increased to 300,000 barrels.

During the year Occidental of Libya, Inc., began construction of a 217-kilometer, 40-inch crude oil pipeline from the Idris field to Zuetina, where a terminal and storage facilities for 2 million barrels of oil were under construction. The line, the country's sixth and the largest in diameter, is scheduled to be in operation in early 1968 with an initial capacity of 150,000 barrels per day. A 24-inch spur line was being built to the Augila field.

The Tobruk terminal of British Petroleum/Nelson Bunker Hunt was dedicated in February 1967. The 1.5-million-barrel-capacity terminal is supplied with oil from the Sarir field through a 515-kilometer, 34-inch pipeline completed in late 1966.

Refining and Marketing.—Libya's only refinery, the Marsa el-Brega plant of Esso Sirte, Inc., began commercial operation early in 1967 after being inoperative since 1963 because of disagreements between Esso and the Government over product prices. Refinery output—regular and premium motor gasoline, diesel oil, kerosene, and residual fuel oil—will satisfy most of Libya's requirements; residual fuel oil output is expected to exceed domestic needs and be available for export. Daily refinery capacity was raised during the year from 8,000 to 10,000 barrels.

Refinery products are marketed by Esso Sirte, Inc., Shell Company of Libya, Ltd., and Societá Lidica per il Petrolio S.p.A. (Asseil).

Natural Gas.—Libya's proved natural gas reserves in 1967 were estimated at 15,000 billion cubic feet,[11] compared with 7,000 billion cubic feet at the end of 1965. Most of the reserves are associated with crude oil. The country's gas reserves ranked second in Africa after those of Algeria.

As in the past, oilfields accounted for all the natural gas produced. Most of the estimated 415 billion cubic feet produced in 1967, was flared; a small amount was used in oilfield operations.

During 1967, Libyan Atlantic/Phillips

[8] Petroleum Intelligence Weekly. Dec. 18, 1967, p. 7.
[9] Petroleum Intelligence Weekly. Feb. 5, 1968, p. 5.
[10] Page 6 of work cited in footnote 9.
[11] Work cited in footnote 5.

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resumed drilling in offshore Concession 88 with the drilling ship *Glomar V*. Gas was discovered there in November 1966, about 35 kilometers from Marsa el-Brega.

Construction of the $200 million Marsa el-Brega natural gas liquefaction plant of Esso Standard Libya, Inc., began in mid-1967 and was scheduled to be completed in late 1968. The plant, which ultimately will have a daily capacity of 380 million cubic feet of gas is to operate initially at a daily capacity of 345 million cubic feet, processing associated natural gas from the Zelten oilfield. When the project is in operation, it will be the first time outside North America that associated natural gas is used for large-volume commercial purposes.[12] Liquefied natural gas will be exported to Italy and Spain under contracts concluded in 1965. Liquefied petroleum gas will be produced for local consumption.

Construction contracts for the largest phase of the project were awarded to the Italian companies, SNAM Progetti, S.p.A. and Compagnia Italiana Montaggi Industriali S.p.A. These involve four major components of the liquefaction plant: Two booster compressors, the treating and drying section, the cyrogenic section, and the refrigeration section.

During 1967 dredging of the Marsa el-Brega harbor was completed to permit accommodation of the special liquefied gas tankers. Two specially designed 300,000-barrel storage tanks were under construction.

During the year, Esso Standard built a 172-kilometer, 36-inch line to transport gas from Zelten oilfield to the liquefaction plant. The 345-million-cubic-foot-per-day line was used in late 1967 to transport crude oil from Zelten to the Marsa el-Brega terminal.[13]

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[12] Review of Arab Petroleum and Economics. V. 2, No. 4, April 1966, p. 10.
[13] Petroleum Intelligence Weekly. Aug. 14, 1967, p. 8.

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The Mineral Industry of the Malagasy Republic

By Eugene R. Slatick [1]

The mineral industry of the Malagasy Republic in 1967 continued to be dominated by the mining or extractive phase. The country remained a major world source of graphite and phlogopite mica. Development work continued on the large chromite deposits discovered several years ago. Petroleum exploration concessions were granted to two companies; several others requested concession areas.

The geological service continued its geological mapping program and continued prospecting for a variety of minerals.[2] It began evaluating several mineral discoveries, including asbestos and molybdenite deposits, and studied several anomalies detected by previous geophysical surveys. A geochemical laboratory was also established.

There are several company operations in Malagasy, including producers of chromite, graphite, and phlogopite mica; however, individual miners account for a considerable part of the production of several commodities significant to the Malagasy mineral economy. These miners market their products, generally destined for export, through various intermediaries. To eliminate the inefficiencies of this method and increase the miners' income and production, the Government considered creating a cooperative organization to establish quality control and a marketing setup. The participation of an experienced U.S. mineral company has been considered.[3]

PRODUCTION

The mine-head value of reported mineral output in 1967 was about 1.9 million,[4] compared with about $3.2 million in 1966. The major minerals by value in 1967 were graphite, $1.1 million, and phlogopite mica, $0.4 million.

[1] Foreign mineral specialist (petroleum), Division of International Activities.

[2] Razafiniparany, A. 1967 Annual Report of the Geological Survey. 159 pp.

[3] International Commerce. V. 73, No. 3. Jan. 16, 1967, p. 49.

[4] Where necessary, values have been converted from Malagasy francs (FMG) to U.S. dollars at the rate of FMG 245 = US$1.00.

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Table 1.—Malagasy Republic: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Beryl	411	212	20	e 20	30
Chromite	11,200	11,770	2,884	------	------
Columbite and tantalite----kilograms	17,200	3,600	4,000	[2] 450	67
Gold----troy ounces	900	440	598	852	752
Manganese ore	------	------	5	------	------
Monazite	615	964	1,085	850	25
Nickel ore [3]	14,388	NA	NA	------	------
Titanium concentrate (ilmenite)	3,653	4,800	6,311	6,188	1,857
Uranium ore and concentrate [3]	482	690	421	r 359	307
Zircon concentrate	388	512	644	705	209
Nonmetals:					
Cement----thousand tons	41	44	39	46	60
Feldspar	r (4)	1	r (4)	------	------
Garnet, abrasive	2	65	69	12	(4)
Graphite	19,245	13,173	17,015	16,366	14,890
Mica, phlogopite:					
Block	97	93	91	64	54
Splittings	868	589	538	653	482
Quartz, crystal----kilograms	28,700	28,300	88,100	99,799	39,500
Salt [5]	200	290	145	456	NA
Stones, semiprecious----kilograms	4,159	3,831	5,822	5,684	164
Mineral fuels:					
Coal, bituminous	2,000	4,000	2,000	------	2,000
Petroleum refinery products thousand 42-gallon barrels	------	------	------	e 235	NA

e Estimate. NA Not available. r Revised.

[1] In addition to commodities listed, a variety of minerals, mainly nonmetallic are produced in very small quantities.

[2] U.S. imports.

[3] Exports.

[4] Less than ½ unit.

[5] Recorded production only.

TRADE

As shown in the following table, the Malagasy Republic had an unfavorable trade balance in 1965 and 1966 in both the mineral and the total trade sector.

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	$4.8	$92.4	5.2
1966	5.2	98.5	5.3
Imports:			
1965	20.0	139.5	14.3
1966	20.0	143.2	14.0
Trade balance:			
1965	−15.2	−47.1	XX
1966	−14.8	−44.7	XX

XX Not applicable.

[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.

The Malagasy Republic maintains a small entrepôt trade, primarily in metal semimanufactures, with several of the nearby islands including St. Christophe, Réunion, and the Comoros, and these re-exports are included in export data. Much of the export trade to European countries in nonferrous metals is presumed to be scrap. Probably the exports of gem stones includes most of the recorded output of quartz crystal. The sharp increase in the exports of iron and steel semimanufactures to Réunion and the Comoros in 1966 may indicate the completion and operation of the 12,000-ton-per-year plant at Tamatave for the production of corrugated and coated steel plants; the increase in zinc imports bears this out, although definitive information about the plant is not available.

Based on value, the principal mineral imports in 1966 were refined petroleum products, $6.8 million; iron and steel semimanufactures, $6.3 million; crude oil, $2.5 million; and cement, $1.6 million. The major mineral exports were graphite, $1.9 million, and phlogopite mica, $1.1 million.

Early in the year the Government modified the 1965 interdiction of trade between the Malagasy Republic and Southern Rhodesia to prohibit specifically the importation of items on the United Nations Mandatory Sanctions List. The minerals included are asbestos, chromite, copper, and iron ore.

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Table 2.—Malagasy Republic: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Beryllium, concentrate	63	6	All to United States.
Chromite	7,800	1	All to France.
Columbite-tantalite	4	1	All to Netherlands.
Copper	243	270	West Germany 198; France 47; Netherlands 22.
Gold, troy ounces	64	-------	
Iron and steel:			
Scrap	6,506	166	Mainly to France.
Semimanufactures	271	1,535	Réunion 1,386; Comoro Islands 144.
Lead, mainly scrap	31	15	France 9; Italy 6.
Thorium and uranium minerals, mainly monazite.	1,564	1,398	All to France.
Tin, long tons	(1)	(1)	All to Comoro Islands.
Zinc	13	8	All to France.
Nonmetals:			
Cement, hydraulic	91	16	St. Christophe 10; Comoro Islands 6.
Gem stones, precious and semiprecious, kilograms	r 84,847	104,433	France 53,334; Hong Kong 35,775.
Garnet, abrasive	105	6	United States 2; Switzerland-Liechtenstein 2.
Graphite	17,994	16,815	United States 5,035; United Kingdom 4,994.
Lime	2	2	All to Comoro Islands.
Mica, crude and worked	963	961	Japan 257; United States 234; Belgium-Luxembourg 170.
Salt	2,085	2,116	Réunion 1,744; Comoro Islands 372.
Stone for construction use	4	9	Réunion 8.
Nonmetals, not elsewhere specified	9	8	Comoro Islands 4.
Mineral fuels:			
Coal and briquets	-------	5	All to Comoro Islands.
Petroleum refinery products, thousand 42-gallon barrels	175	167	Réunion 80; Aden 60.
Tar, pitch, and other crude chemicals from coal, oil and gas distillation.	6	2	Mainly to Comoro Islands.

r Revised. 1 Less than ½ unit.

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Table 3.—Malagasy Republic: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum [1]	533	619	France 500.
Copper [1]	171	107	France 90; United States 17.
Gold, troy ounces	1,897	2,636	All from France.
Iron and steel:			
Scrap	770	20	All from France.
Other	23	50	France 49.
Semimanufactures	29,032	33,276	France 22,858.
Lead [1]	170	263	France 251.
Platinum, troy ounces	514	1,125	All from France.
Silver, do.	9,066	9,677	France 9,517.
Tin [1], long tons	6	10	France 9.
Zinc [1]	49	105	Belgium-Luxembourg 46; France 44.
Metals not elsewhere specified	183	42	Mainly from France.
Nonmetals:			
Abrasive materials	47	43	France 35.
Cement	79,628	65,970	France 33,814; Kenya 15,300.
Chalk	380	352	All from France.
Clays	74	70	France 46; United States 24.
Clay construction materials	11,556	1,152	France 707; West Germany 270.
Diamond, other precious and semiprecious stones, kilograms	1,377	35	France 34.
Fertilizer materials:			
Crude, phosphatic and other natural	2,960	498	Tunisia 445.
Manufactured	4,641	6,591	France 4,107; West Germany 1,303; Tunisia 939.
Ammonia	21	29	France 25.
Gypsum and anhydrite	2,154	2,379	All from France.
Lime	2,540	2,743	Do.
Magnesite	4	8	Netherlands 5; France 2.
Mica, crude and worked, kilograms	2,100	2,313	All from France.
Pigments, mineral	75	104	Do.
Salt	904	541	West Germany 376; France 165.
Sodium and potassium compounds, mainly caustic soda.	203	237	Mainly from France.
Stone for construction use	10	2	Do.
Sulfur, all forms	115	120	France 78; West Germany 28; Netherlands 11.
Talc, kilograms	27,898	77,292	France 77,266.
Nonmetals, not elsewhere specified	445	553	Mainly from Comoro Islands.
Mineral fuels:			
Coal and briquets	14,869	15,202	NA.
Coal tar	------	70	All from France.
Coke and semicoke	72	72	France 67; Rumania 5.
Petroleum:			
Crude	------	1,041	Saudi Arabia 490; Algeria 417; Kuwait 134.
Refinery products:			
Gasoline, thousand 42-gallon barrels	642	594	Iran 380; France 66; India 61.
Kerosine, do.	165	144	Iran 97; France 24; Malaysia 20.
Distillate fuel oil, do.	540	475	Iran 367; France 60; Malaysia 36.
Residual fuel oil, do.	19	16	Aden 7; Kenya 4; Iran 3; France 2.
Lubricants, do.	42	40	France 23; United States 8; Kenya 6.
Liquefied petroleum gas, do.	21	23	Kenya 18; France 5.
Other, do.	54	80	Kenya 31; Iran 23; United States 17.
Total, do.	1,483	1,372	

[1] Including alloys.

COMMODITY REVIEW

METALS

Chromite.—During the year an 84-kilometer road was being built from the large chromite deposits at Andriamena, 161 kilometers north of Tananarive, to the railhead at Lac Alatora. The road will enable these deposits to be developed. Mining operations by Compagnie Minière d'Andriamena (COMINA) a joint venture of the Malagasy Republic Government and several French companies, are expected to begin in 1969; initial production is planned at 85,000 tons of concentrates per year.

Copper.—In October 1967 a financing agreement was signed by the Government and French interests for additional pro-

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specting in the Vohemar and Milaona areas, where copper deposits already have been found.

Monazite.—Production of monazite ended in 1967, presumably because of foreign competition. Monazite had been produced for the export market.

Uranothorianite.—Production of uranothorianite by the French Atomic Energy Commission continued in 1967, but the thoria content was not expected to exceed 30 tons.[5] The uranothorianite deposit continued to be progressively depleted, with no indication of discovery or development of additional reserves.

NONMETALS

Cement.—Talks continued during the year regarding the construction of a 150,000-ton-per-year cement plant at Antsirabe. The plant, which would be the country's second, has been under discussion for the past several years.

Graphite.—In 1967 the Government requested the Bureau de Recherchés Géologiques et Minières to study graphite treatment operations and the world graphite market to determine how the country's graphite industry could increase production and exports.[6]

Salt.—Total salt production is probably many times greater than recorded production. Sea salt evaporation is accomplished at several locations along the west coast, and actual production has been estimated as high as 20,000 tons in past years. No rock salt deposits are known in the country and the source of the few hundred tons of recorded salt output is not known.

MINERAL FUELS

Petroleum.—In June the Government promulgated Decree No. 67–006, entitled "Madagascar Petroleum Fiscal Code," which established fees for exploration concessions.

Interest in oil exploration was high in 1967, particularly on the west coast, where the offshore sedimentary area is more extensive than that off the east coast. During the year two companies were granted exploration concessions in the west: Compagnie Française des Pétroles (CFP) 32,000 square kilometers offshore, and Continental Oil Company, 15,797 square kilometers on land. At yearend 1967, Jack Grynberg and Associates and Tenneco Oil Company, both U.S. companies, were preparing to sign formal agreements for exploration areas. Grynberg's concession will cover both land and offshore areas in the northwest; Tenneco's will be mostly offshore in the east and south. Frontier Sulphur Company, another U.S. company, applied for an offshore exploration permit in the northwest. In addition, five other companies (three United States, one Japanese, one Kuwait) requested exploration permits.

During the year Société des Pétroles de Madagascar (SPM) studied the seismic refraction data obtained at the end of 1966 from its concession in the northwest.

The country's first refinery, the 12,000-barrel-per-day plant near Tamatave, which went on stream in October 1966, completed the first full year of operation. Throughput and output data for the year were not available. The refinery is owned and operated by Société Malgache du Raffinage, a joint venture comprised of France's Entreprise de Recherchés et d'Activités Pétrolières (35 percent), the Malagasy Republic Government (15 percent), Esso Standard Eastern, Inc. (15 percent), California Texas Oil Corporation (12.5 percent), Royal Dutch/Shell Group (7.5 percent), British Petroleum (7.5 percent), CFP (6.5 percent), and the French Desmarais Frères (1.0 percent). The refinery cost more than $10.2 million and employs about 190 persons. Production units include catalytic reforming (1,800 barrels per day) and distillate hydrotreating (6,000 barrels per day).

[5] Engineering and Mining Journal, V. 169, No. 3, March 1968, p. 119
[6] Mines et Métallurgie. No. 3618, June 1967, p. 212.

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The Mineral Industry of Malaysia and Singapore (Including the Independent Sultanate of Brunei)

By A. F. Grube [1]

The economies of Malaysia and Singapore continued to make satisfactory advances during 1967 despite the lack of progress by the two areas toward achieving economic cooperation. Reestablishment during the year, of normal trade relations with Indonesia, a natural trading partner for Malaysia and Singapore, is expected to aid the continued economic growth of the two countries. Both Malaysia and Singapore have benefited from new industries in recent years. As of August 1967, a total of 118 pioneer industries had been established in Singapore with a total capital investment of $330 million. Malaysia has attracted some 140 companies from 18 different countries and the applications of another 60 have been approved in principle.

During the year the Malaysian Government broadened incentives to private business by establishing a Federal Development Administration (FIDA) to guide potential investors to profitable opportunities, business connections, and sources of finance. Both governments openly invite foreign investment and offer substantial incentives to foreign investors. At Prai, Malaya, a $26 million fully integrated steel mill, Malaysia's largest industrial enterprise, was completed in August.

Preliminary official figures show Malaysian gross national product in 1967 at $3,015 million, an increase of 2.8 percent over that of 1966. These gross national product figures understate the increase in the physical volume of Malaysian output to the extent that they reflect price declines in rubber, tin, and palm oil. Volume of tin exports rose by 2.8 percent, while receipts from tin exports declined 4.6 percent, the result of a 7.2 percent decline in the average f.o.b. unit value. Despite the growing diversification of the economy, rubber, tin, and palm oil still accounted for about 22 percent of the gross national product, and more than half of Malaysia's merchandise export receipts in 1967.

Malaysian tin producers were clamoring for the abolishment of the Tin Profits Tax, which was introduced in a period of high tin prices and "confrontation" problems. Producers pay something like a 65 percent tax on profits which became more onerous as tin prices continued to decline.

For the first time offshore tin prospecting licences were granted in 1967 by the Federal Administration and States of Malaya, and furthermore the Malay reserve was opened to tin prospectors. Likewise, additional offshore areas for petroleum exploration were granted to foreign-owned petroleum companies during 1967. These, together with previously granted petroleum permits, cover virtually the entire offshore areas of Malaysia. In 1967 Malaysia also passed petroleum legislation which established the 50–50 profit-sharing arrangement modeled after the

[1] Industry economist, Division of International Activities.

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Organization of Petroleum Exporting Countries (OPEC) tax legistlation.

Under a technical cooperation program agreed upon by France and Malaysia, France sent 12 technical experts, including mining men, to Malaysia early in 1967, who will stay for a 2-year period. The Canadians have proposed the undertaking of a natural resources survey to cost $1.1 million and indicated that Malaysia can expect more aid from Canada in the next few years.

Singapore's entrepôt trade, still the backbone of its economy, continued its steady upward trend in 1967, reaching a record level. Uncertainties which slowed industrial development in the period after separation from Malaysia have been largely solved, and the trend of investment in Singapore again turned upward. Mobil Refining Company (Malaysia) Ltd.'s new $18 million refinery at Jurong, Singapore, operated at full capacity during 1967, and Shell Refining commenced construction of a new refinery at Pulau Bukom.

The economy of Sultanate of Brunei continued to be tied to oil. A preliminary agreement has been reached for the export of natural gas to Japan, which will further increase the Sultanate's revenue. Production from the new West Ampa oilfield continued to increase during 1967, partially offsetting declining production from the old and nearly depleted Seria oilfield.

PRODUCTION

Lowered tin prices and reduced iron ore production adversely affected the 1967 output value of Malaysia's two most important mineral commodities. Despite a 5-percent increase in tin production over that of 1966, the value of tin output was reduced to $235 million, almost 4 percent less than the 1966 value. The physical output of tin is expected to slow over the years ahead. Most of the prime tin mining land has already been worked once and is now being reworked. Malaysia's hope for increased or constant tin production lies in the discovery of additional new tin deposits in the Malay reservation or offshore areas.

Reduced 1967 exports and consequent reduced production of iron ore caused the value to drop from $45 million in 1966 to $42 million in 1967. The reduction resulted from inability of Malaysian iron ore to compete both pricewise and gradewise with Australian ore in the Japanese market. Iron ore production is not expected to increase unless deposits of higher grade are discovered.

Other significant Malaysian mineral commodities include bauxite, with a 1967 value of nearly $5 million; xenotime, (a rare-earth mineral) valued at nearly $2 million; and ilmenite, valued at $0.9 million.

Brunei's 1967 oil and gas production was valued at $78 million. In recent years royalties and taxation paid by the Brunei Shell Petroleum Company, Ltd., have provided the Sultanate with 95 percent of its income.

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Table 1.—Malaysia, Singapore and Brunei: Production of mineral commodities[1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Antimony metal content of ore (Sarawak)	6	78	55	r 59	31
Bauxite:					
Malaya thousand tons	451	471	857	956	900
Sarawak do	158	161	137	(r)	------
Total do	609	632	994	r 956	900
Columbite-tantalite concentrate, columbium-tantalum ratio 4:1, 70 to 80 percent pentoxides	89	57	47	68	89
Copper, flotation concentrate e	2,000	1,085	1,750	762	1,016
Gold:					
Malaya (crude) troy ounces	9,116	7,296	3,982	2,959	1,289
Sarawak (fine) do	2,773	3,115	2,602	2,611	2,521
Iron ore 60 to 64 percent iron thousand tons	7,381	6,569	6,983	5,855	5,436
Manganese ore, 30 to 40 percent manganese	6,982	-------	1,591	r 58,788	85,105
Tin:					
Mine (contained in 75 to 76 percent tin concentrate) long tons	59,947	60,004	63,670	68,886	72,121
Smelter [2] do	84,001	71,351	72,469	71,049	76,328
Titanium concentrate (ilmenite; exports)	149,374	131,337	123,517	118,264	90,806
Tungsten ore and concentrate (wolframite and scheelite) 60 percent WO_3 basis	7	5	10	6	24
Zirconium concentrate (zircon exports)	262	147	571	786	472
Nonmetals:					
Cement:					
Malaya thousand tons	362	466	739	e 850	e 835
Singapore do	194	200	203	388	471
Total do	556	666	942	1,238	1,306
China clay do	1	1	2	2	2
Lime (Sarawak)	166	226	190	132	160
Monazite (exports)	899	308	705	880	962
Xenotime (yttrium mineral exports)	5	e 10	e 10	155	260
Mineral fuels:					
Gas, natural (Brunei) million cubic meters	1,127	e 1,200	1,328	1,989	2,633
Petroleum:					
Crude oil:					
Brunei thousand 42-gallon barrels	29,266	25,913	28,991	35,386	37,961
Sarawak do	373	352	351	r 346	328
Total do	29,639	26,265	29,342	35,732	38,289
Natural gasoline (Brunei) do	676	633	546	533	553
Refined products:					
Gasoline and naphthas do	9,332	10,046	9,917	10,208	e 13,300
Kerosine and jet fuel do	2,131	3,265	3,158	5,006	e 3,800
Distillate fuel oil [3] do	10,139	12,859	13,332	9,386	e 10,000
Residual fuel oil do	22,175	22,453	23,925	30,706	e 35,000
Lubricants do	-------	-------	178	226	e 300
Other do	767	1,017	291	490	e 2,000
Refinery fuel and loss do	980	4,159	3,182	2,081	e 3,500
Total do	45,524	53,799	53,983	58,103	e 67,900

e Estimate. r Revised. NA Not available.
[1] Production from Malaysia unless otherwise shown.
[2] Includes metal smelted from imported concentates.
[3] Includes unfinished oils.

TRADE

Malaysia's overall trade balance remained favorable during 1966, with total exports valued at $1,256 million and imports at $1,096 million. Tin was second only to rubber as an export earner and accounted for 23 percent of Malaysia's export earnings. The United States was Malaysia's major tin customer, receiving 36 percent of its total tin exports, valued at approximately $95 million. Ranking third as an export earner, iron ore was the only other significant mineral export,

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accounting for approximately 3.5 percent of Malaysia's total exports during 1966.

Exports of petroleum products refined from imported crude oil continued to dominate Singapore's mineral commodity export trade in 1966. Total export trade during the year was valued at $246 million with petroleum products accounting for nearly $192 million. Crude oil imports, primarily from Kuwait were valued at $46.5 million or 17 percent by value of Singapore's total 1966 mineral commodity imports. Overall export values were higher in 1966 than in 1965, but the value of mineral commodities showed a slight decrease in relative importance. Total imports increased sharply in 1966, going from $1,244 million in 1965 to $1,328 million in 1966. The adverse effect of increased imports, however, was partially offset by the increased export trade. Accordingly, Singapore's net adverse balance of trade was not as large as in 1965.

Sarawak's balance of trade gap widened even further in 1966, with imports increasing by 8.4 percent over those of 1965 and exports increasing by only 6.9 percent. Mineral fuels remained a major component of both the import and export trade of the area. Imports of mineral fuels increased by nearly 12 percent in 1966 over those of 1965 and exports increased by nearly 11 percent. Sarawak in 1966 imported more than 34 million barrels of crude oil and petroleum products from Brunei, valued at nearly $63 million. Sarawak's exports of crude oil and petroleum products were valued at $78 million.

Sabah's 1966 imports included 1,158,000 barrels of petroleum products valued at $12 million, mainly from Singapore and Iran; 38,932 troy ounces of gold bullion imported from the United Kingdom; 17,950 metric tons of iron and steel products; and 38,737 metric tons of cement and clinker.

Crude oil exports amounting to 33,861,000 barrels accounted for more than 95 percent by value of Brunei's total 1966 export trade. Significant imports included 35,447 metric tons of cement, 59,217 troy ounces of gold bullion, and 22,017 metric tons of iron and steel products.

The value of total trade, mineral commodity trade, and the net trade balance for Malaysia, Singapore, and Brunei for 1965–66 are summarized in the following tabulation:

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	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
MALAYSIA [1]			
Exports:			
1965:			
Malaya	367	1,005	36.5
Sabah	1	98	1.0
Sarawak	65	133	48.9
Total	433	1,236	35.0
1966:			
Malaya	340	997	34.1
Sabah	2	115	1.7
Sarawak	NA	144	NA
Total [2]	342	1,256	27.2
Imports:			
1965:			
Malaya	156	843	18.5
Sabah	12	102	11.8
Sarawak	75	151	49.7
Total	243	1,096	22.2
1966:			
Malaya	149	850	17.5
Sabah	13	98	13.3
Sarawak	NA	156	NA
Total [2]	162	1,104	14.7
Net trade balance:			
1965:			
Malaya	211	162	XX
Sabah	−11	−4	XX
Sarawak	−10	−18	XX
Total [2]	190	140	XX
1966:			
Malaya	191	147	XX
Sabah	−11	17	XX
Sarawak	NA	−12	XX
Total [2]	180	152	XX
SINGAPORE			
Exports:			
1965	234	981	23.9
1966	246	1,102	22.3
Imports:			
1965	236	1,244	19.0
1966	274	1,328	20.6
Net trade balance:			
1965	−2	−263	XX
1966	−28	−226	XX
BRUNEI			
Exports:			
1965	63	65	96.9
1966	71	73	97.3
Imports:			
1965	5	37	13.5
1966	10	51	19.6
Net trade balance:			
1965	58	28	XX
1966	61	22	XX

NA Not available. XX Not applicable.
[1] Excludes trade between individual components.
[2] Total is of listed figures only.

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Table 2.—Malaysia, Singapore and Brunei: Exports and reexports of selected mineral commodities, 1966

(Metric tons unless otherwise specified)

Commodity	Quantity	Principal destinations
MALAYA		
Metals:		
Bauxite	1,023,000	Japan 599,325; Hong Kong 235,128; Canada 91,431.
Copper, all forms	78	NA.
Iron and steel:		
Iron ore—thousand tons	5,772	Japan 5,697; Taiwan 58; Singapore 16.
Iron and steel scrap	33,284	Singapore 19,587; Japan 9,968; Taiwan 3,632.
Semimanufactures	1,300	Sabah 541; Sarawak 235.
Manganese ore	69,319	Japan 69,304.
Other nonferrous ore	119,164	Japan 97,165; France 21, 237.
Other nonferrous scrap	5,287	Japan 1,938; Singapore 2,507.
Tin:		
Ore—long tons	1,254	All to Singapore.
Tin scrap—do	2,873	Netherlands 2,850.
Tin and tin alloys, unwrought—do	71,468	United States 26,298; Japan 16,032; Italy 4,321.
Titanium concentrate (ilmenite)	118,254	Japan 96,917.
Uranium and thorium ore—value thousands	$680	Japan $324; United Kingdom $178.
Nonmetals:		
Cement	158,007	Singapore 141,532; Indonesia 7,746.
Fertilizers, manufactured	7,698	Thailand 7,625.
Mineral fuels:		
Petroleum:		
Crude oil.[1]—thousand 42-gallon barrels	1,927	Singapore 1,535; Australia 392.
Refinery products:		
Gasoline—do	954	Singapore 479; South Viet-Nam 200; Thailand 143.
Kerosine—do	590	Singapore 276; South Viet-Nam 210.
Distillate fuel oil—do	950	Thailand 383; Singapore 305; Sabah 97.
Residual fuel oil—do	2,013	Singapore 1,278; South Viet-Nam 733.
Total—do	4,507	
SABAH		
Metals:		
Aluminum, all forms	1	Mostly to Pakistan and Singapore.
Copper and alloys, all forms	2	Mostly to Singapore.
Iron and steel:		
Iron and steel scrap	724	Singapore 711.
Semimanufactures	411	Sarawak 359.
Other nonferrous scrap and waste	193	Singapore 182.
Nonmetals:		
Cement and clinker	389	Sarawak 220; Brunei 168.
Earth colors	3	All to Singapore.
Mineral fuels:		
Refinery products:		
Gasoline—thousands of 42-gallon barrels	10	Singapore 6; Brunei 3.
Kerosine—do	5	Brunei 4.
Jet fuel—do	14	Brunei 11.
Distillate fuel oil—do	22	All to Sarawak.
Total—do	51	
Petroleum bunkers:		
Ships' bunkers—do	68	Sarawak 8; Hong Kong 6; Netherlands 4.
Aviation bunkers—do	54	Malaya 38; Hong Kong 9; United Kingdom 7.
Total—do	122	

See footnote at end of table.

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Table 2.—Malaysia, Singapore and Brunei: Exports and reexports of selected mineral commodities, 1966—Continued

(Metric tons unless otherwise specified)

Commodity	Quantity	Principal destinations
SINGAPORE		
Metals:		
Aluminum, all forms	913	Malaysia 804.
Copper:		
Ore	1,016	All to Japan.
Metal and alloys, all forms	1,087	Malaysia 424.
Iron and steel:		
Iron and steel scrap	8,591	Japan 5,655; Malaysia 2,274.
Pig iron and ferroalloys	2,424	Malaysia 2,276.
Ingots and other primary forms	2,077	South Viet-Nam 1,477.
Semimanufactures	119,537	Malaysia 101,158; South Viet-Nam 1,092.
Lead, all forms	615	Malaysia 470.
Manganese ore	1,509	Malaysia 1,408.
Nickel, all forms	9	Malaysia 9.
Silver, unworked thousand troy ounces	1,160	United Kingdom 1,159.
Tin:		
Ore long tons	2,322	All to Malaysia.
Slag and hard head do	10	Malaysia 5; United States 5.
Other forms do	761	Malaysia 610.
Zinc, all forms	187	Malaysia 164.
Nonmetals:		
Cement and clinker	32,085	Brunei 8,735; Sarawak 4,651; Sabah 2,096.
Fertilizers, manufactured, all types	92,481	Malaysia 91,785.
Natural phosphates	19,657	Malaysia 19,336.
Mineral fuels:		
Coal all types	68	Malaysia 65.
Petroleum:		
Crude thousand 42-gallon barrels (reexports).	53	All to New Zealand.
Unfinished oils do	19	All to Norway.
Refinery products:		
Aviation gasoline do	2,421	South Viet-Nam 1,398.
Motor gasoline do	7,916	South Viet-Nam 3,623.
Kerosine do	2,114	South Viet-Nam 1,025.
Jet fuel do	10,255	South Viet-Nam 5,736; Thailand 2,986.
Distillate fuel oil do	11,582	South Viet-Nam 4,040; Thailand 1,760; Malaysia 2,019.
Residual fuel oil do	18,115	Japan 8,462; Hong Kong 3,739; Netherlands 2,433.
Lubricating oils do	680	Thailand 251; Malaysia 197.
Asphalt do	312	Malaysia 87; Hong Kong 72; South Viet-Nam 70.
Other do	26	Malaysia 14; Thailand 7.
Total do	53,420	
BRUNEI		
Metals:		
Aluminum, all forms	29	Hong Kong 28.
Copper and alloys, all forms	3	All to Sarawak.
Iron and steel, all forms	1,847	Sarawak 1,232; Taiwan 508.
Mineral fuels:		
Petroleum:		
Crude oil thousand 42-gallon barrels	33,861	Sarawak 33,860.
Unfinished oils do	61	All to Sarawak.
Refinery products:		
Gasoline do	367	Virtually all to Sarawak.
Kerosine do	2	All to Sarawak.
Distillate fuel oil do	17	Virtually all to Sarawak.
Other do	1	Do.
Total do	387	
Petroleum gases value	$241,520	Sarawak $231,289; Sabah $10,231.

[1] Reexport.

Source: Department of Statistics. Singapore External Trade Statistics. October to December 1966 and 12 months ended December 1966, and UN Commodity Trade Statistics 1966.

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Table 3.—Malaysia, Singapore and Brunei: Imports of selected mineral commodities, 1966

(Metric tons unless otherwise specified)

Commodity	Quantity	Principal sources
MALAYA		
Metals:		
Aluminum, all forms	4,641	Canada 1,592; United Kingdom 1,447, Japan 730.
Copper and alloys, all forms	2,471	Zambia 1,075; Japan 321.
Iron and steel:		
Iron and steel scrap	5,168	West Germany 2,867.
Pig iron	8,370	China, mainland 3,642; Australia 3,605.
Semimanufactures:		
Bars, rods, and shapes	118,610	Japan 42,130; China, mainland 31,956; Singapore 20,131.
Plates and sheets	107,957	Japan 83,330; United Kingdom 7,924; Australia 6,121.
Other	93,775	Singapore 29,424; Japan 22,752; China, mainland 18,698.
Lead, all forms	636	Singapore 253; United Kingdom 146.
Manganese ore	1,408	Singapore 734.
Tin:		
Ore—long tons	3,242	Singapore 1,251; Thailand 1,017; Laos 746.
Metal and alloys, all forms—do	278	Indonesia 156.
Zinc:		
Ore and concentrate	847	Australia 586.
Metal and alloys, all forms	282	Indonesia 159.
Other nonferrous metal scrap and waste	1,072	Singapore 1,011.
Nonmetals:		
Asbestos	8,982	Canada 6,566.
Cement	5,318	United Kingdom 1,884.
Fertilizer materials:		
Crude:		
Phosphate rock	113,639	United States 20,312; United Kingdom 5,956.
Manufactured:		
Nitrogenous	155,320	West Germany 70,154; United Kingdom 63,041 Japan 18,728.
Phosphatic	6,581	West Germany 2,762; Netherlands 1,905.
Potassic	45,668	Israel 18,628; West Germany 14,809; France 10,243.
Salt	72,829	Thailand 49,547.
Sulfur	5,145	France 4,848.
Mineral fuels:		
Coal	23,098	Australia 15,095; China, mainland 7,998.
Coke	6,173	Netherlands 2,854.
Petroleum:		
Crude—thousand 42-gallon barrels	19,630	Saudi Arabia 9,759; Kuwait 6,980; Sarawak 2,891.
Refinery products:		
Gasoline—do	805	Singapore 339; Saudi Arabia 234; Bahrain 156.
Kerosine—do	700	Saudi Arabia 265; Singapore 263; Bahrain 108.
Distillate fuel oil—do	2,517	Saudi Arabia 1,227; Singapore 1,095.
Residual fuel oil—do	238	Singapore 114.
Other—do	190	United States 49; United Kingdom 10.
Total—do	4,445	

See footnote at end of table.

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Table 3.—Malaysia, Singapore and Brunei: Imports of selected mineral commodities, 1966—Continued

(Metric tons unless otherwise specified)

Commodity	Quantity	Principal destinations
SABAH		
Metals:		
Aluminum, all forms	127	Japan 47; Belgium-Luxembourg 32; United Kingdom 26.
Copper, all forms	62	United Kingdom 23; Hong Kong 10.
Gold bullion troy ounces	38,932	All from the United Kingdom.
Iron and steel:		
Ore and scrap	1	Nearly all from the Philippines.
Pig iron and ferroalloys	2	All from China, mainland.
Ingots and other primary forms	219	Hong Kong 63; Japan 56.
Semimanufactures	17,950	Japan 5,114; Malaya 3,033; United Kingdom 2,428.
Lead, all forms	42	Singapore 17; United Kingdom 7.
Nickel, all forms	4	Japan 3.
Tin, all forms long tons	24	Singapore 18.
Zinc, all forms	9	Singapore 3; United Kingdom 3.
Other nonferrous metal scrap	14	Philippines 6; Borneo 5.
Nonmetals:		
Cement and clinker	38,737	Japan 17,057; China, mainland 11,772; Malaya 4,297.
Phosphate rock	588	Christmas Island 508; Japan 51.
Sulfur	3	China, mainland 1.
Talc and soapstone	84	China, mainland 43; Malaya 22.
Mineral fuels:		
Coal	26	Sarawak 25.
Coke	34	Hong Kong 16; United Kingdom 12.
Petroleum:		
Crude oil. thousand 42-gallon barrels	7	United States 6.
Refinery products:		
Gasoline do	379	Singapore 211; Iran 76.
Kerosine do	62	Malaya 36; Singapore 14; Iran 12.
Jet fuel do	98	All from Singapore.
Distillate fuel oil do	507	Iran 202; Singapore 134; Malaya 131.
Residual fuel oil do	77	Singapore 50; Sarawak 26.
Other do	35	Singapore 21; United States 10.
Total do	1,158	
SINGAPORE		
Metals:		
Aluminum:		
Bauxite	62,061	Malaysia 62,011.
Metal and alloys, all forms	3,158	Hong Kong 427; United Kingdom 311; West Germany 136.
Copper:		
Ore	762	All from Malaysia.
Metal and alloys, all forms	2,022	Japan 969; United Kingdom 485.
Iron and steel:		
Iron and steel scrap	24,390	Malaysia 20,740; Belgium-Luxembourg 2,080.
Pig iron and ferroalloys	11,378	U.S.S.R. 4,009; Australia 1,319; China, mainland 1,900.
Ingots and other primary forms	5,186	Japan 2,240; China, mainland 1,423.
Semimanufactures	238,000	Japan 147,250; China, mainland 21,928; Australia 13,765.
Lead, all forms	483	Australia 206; United Kingdom 167.
Manganese ore	5,666	NA.
Nickel, all forms	7	United Kingdom 5.
Silver, unworked troy ounces	3,011	United Kingdom 2,661.
Tin:		
Ore long tons	1,309	Malaysia 1,254.
Slag and hard head do	23	All from Malaysia.
Other forms do	597	Malaysia 463; United Kingdom 66.
Zinc:		
Ore	1	All from West Germany and United Kingdom.
Other forms	4,816	Japan 2,455; Australia 1,923.

See footnote at end of table.

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Table 3.—Malaysia, Singapore and Brunei: Imports of selected mineral commodities, 1966—Continued

(Metric tons unless otherwise specified)

Commodity	Quantity	Principal destinations
SINGAPORE		
Nonmetals:		
Cement and clinker	420,744	Japan 174,722; Malaysia 149,287; Taiwan 51,501.
Fertilizers, manufactured, all types	81,197	West Germany 40,197; Japan 6,900; East Germany 3,120.
Natural phosphates	22,926	Christmas Island 16,383; United States 6,505.
Mineral fuels:		
Coal	3,895	Australia 3,877.
Coke	3,566	Taiwan 1,564; Netherlands 1,055.
Petroleum:		
Crude—thousand 42-gallon barrels	25,086	Kuwait 19,126; Saudi Arabia 3,394; Iraq 1,796.
Unfinished oils—do	1,677	All from Malaysia.
Refinery products:		
Aviation gasoline—do	2,432	Iran 1,346; Netherlands Antilles 940.
Motor gasoline—do	5,058	Iran 2,349; India 906; Malaysia 722.
Kerosine—do	2,797	Malaysia 1,111; Iran 913; Japan 246.
Jet fuel—do	8,226	Malaysia 3,309; Netherlands 2,263; Iran 1,407.
Distillate fuel oil—do	8,020	Kuwait 2,726; Malaysia 1,586; Iran 1,026.
Residual fuel oil—do	22,383	Malaysia 9,722; Kuwait 3,704; Iran 2,345.
Lubricating oils—do	863	Netherlands Antilles 562; United States 215.
Asphalt—do	37	Thailand 12; Netherlands 8.
Petroleum coke—do	118	Malaysia 117.
Other—do	20	United States 4.
Total—do	49,954	
BRUNEI		
Metals:		
Aluminum, all forms	179	Italy 102; United States 16.
Copper and alloys, all forms	33	United Kingdom 15; Japan 3.
Gold bullion—troy ounces	59,217	All from the United Kingdom.
Iron and steel, all forms	22,017	Japan 8,621; West Germany 3,088; China, mainland 1,360.
Lead, all forms	14	Singapore 8; United Kingdom 4.
Silver, all forms—troy ounces	13,503	All from the United Kingdom.
Tin, all forms—long tons	5	United Kingdom 4.
Zinc, all forms	12	Japan 7; Singapore 3.
Nonmetals:		
Cement and clinker	35,447	China, mainland 14,688; West Germany 6,683; Taiwan 5,600.
Fertilizers, manufactured	36	West Germany 11; Japan 8.
Mineral fuels:		
Coke	42	Hong Kong 41.
Petroleum:		
Refinery products:		
Gasoline—thousand 42-gallon barrels	24	Practically all from Singapore.
Kerosine—do	15	Singapore 14.
Asphalt—do	9	United Kingdom 5; Singapore 4.
Other—do	15	Singapore 12.
Total—do	63	
Liquefied petroleum gas—value	$18,839	Malaya $16,380.

NA Not available.

COMMODITY REVIEW

METALS

Bauxite.—All bauxite mined in Malaysia during 1967, approximately 900,000 metric tons, came from Telok Ramunia in Johore. The only other producer a few years earlier—Semantan in Sarawak—had been mined out in October 1965. As of early 1967, ore reserves at Telok Ramunia amounted to about 20 million tons. The entire output is exported, mainly to Japan.

During 1967 the most up-to-date aluminum anodizing plant in Southeast

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Asia was built by Diethelm and Co. Ltd. at Singapore. This plant, costing nearly $500,000, is able to process 1.5 million square feet of aluminum extrustions and sheets per year.

Copper.—At yearend 1967 the Japanese quasi-government firm, Overseas Mineral Development Co., Ltd., was awarded prospecting rights for what may be one of the largest copper finds in Southeast Asia. The porphry-type deposit, in Mamut Valley on Mount Kinabalu, may contain 50 to 100 million tons of ore, averaging 0.7 percent copper plus gold of significant value. This deposit was first discovered during a United Nations geochemical survey made during 1965.

The small recorded copper production of Malaysia was a byproduct of underground tin mining by Pahang Consolidated Co. Ltd. at Sungei Lembing in Pahang.

Gold.—As in past years most of the gold mined in Sarawak came from the Bau district, and more than 30 percent of Malay's gold production is a byproduct of tin mining. Detailed mapping of the Bau area from 1963 to 1966 failed to reveal significant additional ore bodies, and production from this area is unlikely to increase.

Iron Ore.—Iron ore production declined for the second consecutive year as shipments to Japan, practically the only market for Malaysia's iron ore, declined. Japanese imports in 1967 of 5,180,897 metric tons were 585,000 metric tons below the 1966 level.

During 1967, about 30 iron mines were in operation. The only large mines, however, were Bukit Besi at Dungan Trengganu and Bukit Ibam at Rompin, Pahang. Both are owned by the Eastern Mining and Metals Company, Ltd., the latter being operated by a subsidiary, the Rompin Mining Company, Ltd. Bukit Besi has ore reserve and declining grade problems. Moreover, there is a tin mine in the middle of this open pit operation. The Bukit Ibam mine, which produced more than 2 million tons in 1967 or a little more than Bukit Besi, has considerable reserves although the ore contains nonferrous impurities.

Based upon 9 month's production data, 1967 iron ore production by States was distributed as follows, in percent: Pahang, 54.3; Trengganu, 31.0; Johore, 6.7; Perak, 5.1; Kedah 2.6 and Selangor 0.3. In December 1966 Sungei Gua (Brimco) Co. Ltd. opened a mine at Lipis in Pahang State that is expected to produce about 150,000 tons of ore per year for shipment mainly to Japan. This mine is owned by the Kokan Mining Company of Japan, which has large mining interests in West Malaysia, and by local Malaysian business men.

Iron and Steel.—The steel mill of Malayawata Steel Limited, located in Prai, Wellesley Province, commenced operation in August 1967 as a joint Malaysian-Japanese venture. The total cost of the mill was close to $27 million. Financing was provided mainly by the Japanese steel company, Yawata Iron and Steel Company, Ltd.; the Malaysian Government through Malaysian Development Finance Ltd.; and other Japanese and Malaysian investors, but International Finance Corporation, an affiliate of the World Bank, assisted to the extent of $3.47 million. The company at yearend was operating with one blast furnace, producing 200 tons of pig iron a day, and two 15-ton capacity Linz-Donawitz converters. Monthly steel product output totals 4,000 to 5,000 tons. The mill is expected to produce 124,000 tons of iron, 121,000 tons of steel, and 111,000 tons of rolled products per year when in full operation. The company intends to increase pig iron capacity by adding another blast furnace which is to be placed into operation in 1969. This steel plant is unusual in that it uses wood charcoal as the main reducing agent. The Malayan Government requested that the plant be designed to utilize charcoal from locally available rubber trees and other wood to obviate dependence upon imported coke.

At year end 1967 Singapore had two iron and steel mills—the National Iron and Steel Mills and the Malayan Iron and Steel Mills Ltd. The National Iron and Steel Mills, the larger of the two, had an annual capacity of 180,000 tons of finished products and was slated to be expanded into an integrated steel plant with an annual capacity of 500,000 tons of finished products.

Manganese.—Increasing amounts of manganese ore were being produced as a byproduct of iron ore mining. Most of

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the production was in the form of ferruginous manganese ore with relatively small amounts of higher quality ore being produced. The 1967 production of manganese ore consisted of 1,727 metric tons of ore having a metal content of 35 percent or better with the remaining production, 83,378 tons, being ferruginous manganese. Virtually the entire production is exported to Japan. In 1967, Japan imported 49,505 tons of Malaysian ferruginous manganese with a c.i.f. value of $714,000.

Most of Malaysia's manganese production comes from the mines of the Good Earth Mining Company. The mines are located in the Lake Chini area of Pekau, Pahang.

Rare Earths.—Relatively small quantities of xenotime, containing rare-earth yttrium group elements, were produced as a byproduct of Malayan tin mining. During 1967 production of xenotime amounted to nearly 50 tons per month. Tin mines in Perak, Malaya, accounted for 20 tons, and those in Pahang, Malaya, for 30 per month. Virtually all the xenotime produced is exported to Japan. At yearend 1967 Japanese importers were paying Malaysian miners $2,160 per ton for xenotime concentrates containing 30 percent yttrium. This provides a useful bonus to those tin miners fortunate enough to have the ore in their mines. The Malaysian Government levies a 10-percent ad valorem duty on xenotime production.

Early in 1967 the Malaysian Geological Department evolved an X-ray process by which the amount of the rare yttrium metal in the ore can be determined at the mine site in a matter of minutes. Previously, samples were sent to England for an analysis, which was both a time-consuming and expensive operation—about $60 per analysis plus freight. The new X-ray method costs only $20 per analysis, and small mine owners can now take advantage of the service.

Tin.—Malaysia's tin production in 1967 established a new postwar record for the third successive year by topping 72,000 long tons for the fifth time in the industry's 60-year history. The four other peak output years were 1940 (83,000 tons); 1941 (79,400 tons); 1937 (77,266 tons); and 1929 (72,326 tons). Despite increased production, however, export duties accruing to the Government were less in 1967 than in 1966. In 1967 tin earned $37.6 million in export duties, as contrasted to $38.9 million in 1966, even though more tin was produced. This underlines the effect of the lower 1967 tin prices.

Perak remained the chief producing State, accounting for more than half of 1967 output. Selangor, with slightly more than 30 percent followed; then the States of Perlis, Kedah, Negeri Sembilan, Malacca, Johore, Pahang, and Trengganu, providing lesser amounts, followed.

In recent years the importance of the gravel-pump mining sector of the Malaysian tin mining industry has been increasing. In 1965, gravel-pump mines accounted for only 48.47 percent of production; in 1966, 53.44 percent; and in 1967, 55.56 percent. Most mines in this sector are owned, operated, and staffed by Chinese-Malaysians. At yearend 1967 there were 1,072 tin mines active in Malaysia, including 66 dredge mines, 960 gravel pump mines, and 49 mines employing other methods. Malaysia ended the year with a fleet of 68 active dredges including two new ones and a third dredge under construction. Of the new dredges, one was the world's largest land-based tin dredge. This dredge, Malayan Tin's number 7, began operating trials at Kampong Gajah on November 3, 1967. It represents an investment of more than $3.5 million. It is equipped with 20-cubic-foot buckets and will dig to a maximum depth of 150 feet. The other new dredge, Selangor Dredgings' number 1, began trial runs in March 11, 1967. It is unique in that it is the first dredge built entirely in Malaysia. The dredge under construction is Aokam Tin's number 3. This new seagoing bucket dredge is being built to replace a grab type dredge.

Malaysia's largest opencast tin mining company, Sungei Besi, obtained an additional 10.8 million cubic yards of tin-bearing ground in 1967. In the first 11 months of 1967, Sungei Besi produced 1,800 tons of tin concentrates against 1,536 tons during calendar year 1966. The full years output is expected to match, or even top, the previous peak output of 1,943 tons produced in 1961. A new mining and treatment plant being installed at their mine could materially increase production during 1968.

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During 1967 offshore areas on the west coast of Malaya were opened to bidding for tin prospecting licenses by the Federal administration and the Malayan States. Tin mining companies had long been interested in these offshore areas, but the failure of the Federal administration and the States to resolve the matter of jurisdiction over these areas until 1967 had precluded the offering of these areas for bidding.

Early in 1968 the Malaysian Government officially announced the awarding of tin prospecting licenses to three foreign-owned companies. The successful companies were (1) The Ocean Mining Company, which was awarded areas off the coasts of the States of Kedah and Perlis and which is a Swiss-registered concern owned jointly by De Beers Corporation of London, and the United States company, Ocean Science and Engineering, Inc., (2) Conzinc Riotinto Malaysia, Ltd., which will prospect off the coast of the States of Penang, Perak, and Selangor. This company is a joint venture with interests held by Riotinto Finance and Exploration Ltd. of London; The Bethlehem Mines Corp., a subsidiary of the United States Bethlehem Steel Corporation; the Malaysian Government, and the Governments of the three States; (3) the Billiton Company, whose licenses cover the seabed areas off the coast of the States of Negri Sembilan, Malacca, and Johore. The Billiton Company is owned by Netherlands interests. A special meeting between representatives of the Federal Government, the States, and the companies is to be held for the purpose of working out the terms and conditions under which the companies are to operate. A comprehensive survey of the areas is scheduled to start immediately upon the completion of these negotiations.

It has also been reported that the all-Malaya Chinese Mining Association has applied for a tin prospecting licensing covering 23,500 acres off the coast of Lamut. The Association has funded an offshore mining company to conduct prospecting operations if they are awarded a permit.

During 1967 the State Government of Perak opened up the Malaysian reserve area for tin mining. The total area involved amounted to 90,000 acres, of which 60,000 acres were set aside as a Malaysian reserve available for prospecting by Malaysians only. As of May 1967, the State had approved of 38 applicants whose permits cover 8,544 acres.

Malaysia's two largest tin smelters, Straits Trading, at Butterworth, and Eastern Smelting Co., Ltd., at Penang, operated at full capacity during 1967. The smaller smelter of Oriental Tin Smelters Ltd. controlled by the Japanese firm Ishihara Sangyo Kaisha, however, suffered from a shortage of tin concentrates and was able to operate at only two-thirds capacity. To insure adequate supplies in the future, the company has entered into supply contracts with tin mines of the Marble Bar area of Australia. Reportedly the company is to receive 80 tons per month of 70 percent tin concentrate. Exports of primary tin metal from Malaysia's three tin smelters amounted to 73,851 tons in 1967, against 71,626 tons in 1966, and 68,846 tons in 1965.

NONMETALS

Cement.—Annual production capacity of Singapore's three cement plants stood at 600,000 tons at yearend 1967. This capacity was realized by the opening in May 1966, of the Asia Cement (Malaysia) Ltd., cement plant. This plant, located at the Jurong Industrial estate obtains its clinker from Taiwan and gypsum from Australia.

The Singapore Government levies an import duty of $3.90 and $1.95 on cement and clinker, respectively, to protect the domestic industry. These levies were brought about by the abnormally low cement prices prevailing in Singapore during 1965 due to competition from imported cement. During 1966 Singapore imported 420,744 tons of cement and clinker.

The second kiln of the Tasek Cement Ltd., plant at Ipoh, Malaysia, went into operation as scheduled in August 1966, raising the plant's present annual capacity to about 400,000 tons. Early in 1967 two leading cement firms in West Malaysia, Malayan Cement Berhad and Pan-Malaysian Cement Works Berhad, agreed to merge in order to strengthen their operations in Malaysia and Singapore. The merged company is to be know as Associated Pan-Malaysia Cement Sendirian Berhad.

Fertilizer.—The new $50 million Chemical Company of Malaysia Ltd. fertilizer

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and chlorine plant at Padang Jawa, Malaysia, commenced operations in Janurary 1967. The complex, a joint venture between Imperial Chemical Industries Ltd. and Malaysian interests, has a production capacity of 200,000 tons of fertilizer per year. After an initial stockbuilding period the firm will place three compound fertilizers on the market, which are designed primarily for the rubber plantations. The factory uses ammonia by-products from the Esso oil refinery to manufacture its products. The new Esso ammonia plant at Port Dickson was officially opened on May 20, 1967. The ammonia plant has a production capacity of approximately 50,000 tons of ammonia and sulfur per year.

Marble.—The Langkawi Marble Company, Ltd., which began operating its $72,000 plant in 1963, is making an extensive effort to capture the local marble market. This company, with headquarters at Kuala Lumpur, is the only marble producer in Malaysia. Marble produced by the company has the characteristics and conformation of white Carrara marble. Production is obtained from the Malaysian islands of Langkawi, Bunting, Dayang, Paku, and Pasu, as well as several islands in the straits of Malacca.

Silica.—Sarawak has granted three prospecting licenses for silica sand. These licenses are in the Bintulu, Baram, and Lundu districts. The names of the companies and acreage involved was not reported.

MINERAL FUELS

Coal.—The intensive survey of the Bintulu coalfields by the Borneo Region Geological Survey under the auspices of the United Nations Special Fund was completed. Results of this survey indicated that the coal has moderate to poor coking qualities and, in places, a high sulfur content. These factors would inhibit economic exploitation.

The Nippon Coal Mining Company of Japan was granted an extension of their prospecting license until September 30, 1967. The Japanese have spent the last 6 years investigating means of exploiting coal deposits of Silantek in Sarawak's second division. The Japanese indicated that they would like to exploit the clay deposits at Silantek and leave the coal for the time being. The Sarawak Government, however, stipulated that the exploitation of clay and coal had to be simultaneously undertaken on a long-term basis.

Petroleum.—The new refinery of Mobil Refining Company (Malaysia) Ltd., located at Jurong, Singapore operated at full capacity during 1967, and the Shell Refining Company Malaya, Ltd., completed the expansion of their Port Dickson, Malaya, refinery during the year. In addition, the Shell Company started construction of a new refinery adjacent to their existing one at Pulau Bukom. The new plant will have a crude distillation capacity of 60,000 barrels per day. As of January 1, 1968, total refinery capacity of the region was 200,500 barrels per day distributed among six refineries—three each in Malaysia and Singapore. During 1967 it was estimated that these refineries processed 77.6 million barrels of crude and produced an estimated 67.9 million barrels of refined products. Imports of crude oil and refined products to Malaysia and Singapore, exclusive of inter-area transfers amounted to approximately 2,-202,000 barrels and 32,000,000 barrels, respectively, during 1966.

In October 1967 the Malaysian Government granted offshore exploration rights along the east coast of Malaya to Standard Oil Company (New Jersey) and the Continental Oil Company. Standard Oil was awarded the northern part and Continental the southern portion. Additionally, three foreign-owned oil companies have applied for exploration rights along the west coast of Malaya. These firms are Mobil Oil Company, Frontier Petroleum Company, and Amoco (Malaysia) Petroleum Company. These applications are now being processed by the Government of Malaysia. If these applicants are granted exploration rights, virtually the entire offshore area of Malaysia will be covered by exploration or exploitation contracts held by foreign-owned oil companies.

The only crude oil production in the area is by subsidiary companies of the Royal Dutch–Shell Group. A largely depleted field, Miri in Sarawak, produced 328,334 barrels during 1967, and another old established field, Seria in Brunei, also on the decline, produced 21,448,000 barrels. An offshore field, South-West Ampa

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in Brunei waters, a more recent discovery, produced 16,513,000 barrels and has not yet reached peak production. All Brunei crude oil production is transported by pipeline to Lutong, Sarawak, for refining or exporting. Brunei also produces natural gasoline and natural gas, with 1967 production being 553,000 barrels and 2,633 million cubic meters, respectively. Early in 1968 it was reported that Shell Brunei was negotiating with the Japanese firm, Teikoku Oil Company, for the sale, over a period of 20 years, of 2,000 million cubic meters of gas each year. The companies have supposedly reached a tentative agreement. Previous negotiations for the sale of natural gas to Japan failed because competition from Alaskan natural gas was too strong.

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The Mineral Industry of Mexico

By Burton E. Ashley [1]

The mining industry generally lagged behind the brisk pace of the Mexican economy in 1967. Tonnage output of many of Mexico's mineral commodities was down from 1966 levels. However, because of favorable silver prices, estimated value of metallic mineral production gained slightly more than 3 percent compared with the 1966 value.

Excluding petroleum, the mining industry contributed between 1.5 and 2 percent to the 1967 Gross National Product.

While the mining industry segment appeared to have experienced a setback in some respects, the situation was regarded as temporary.

Some important aspects of the 1961 mining law were implemented which gave tax relief to some sectors of the industry, and indirectly made working capital available for expansion of mine, plant, and exploration programs.

Continued Mexicanization of various firms also provided wider scope for operation in many cases. Incentive was found to rehabilitate abandoned mines. Increasing world demand for selected nonmetallic minerals provided the required encouragement for expansion.

The Mexican Government was active in a number of mining fields. It sponsored exploration for copper, coal, and iron ore; it encouraged and assisted development of sulfur sources, increased production of zinc metal at its Saltillo smelter, and returned to operation a silver mine abandoned during the early 1930's.

Fiscal measures put into effect to stimulate the producing sector included the automatic rebate of 50 percent of the federal tax on minerals, metals, and compounds originating in Mexican or Mexicanized firms. Heretofore, the entire tax had to be paid, and the rebate returned upon application. The automatic rebate system freed large amounts of capital formerly held on deposit. The same tax rule was applied to metals and byproducts originating in Mexican-controlled beneficiation plants, foundries, and refineries.

General guidelines were established to eliminate any official discretion in granting the 50-percent tax rebate.

Mexicanized firms opening new mines, or rehabilitating old ones, or beginning new industries based on mineral raw materials, were granted a subsidy of up to 40 percent of the ordinary income tax.

The production tax on gold was reduced to 50 percent of the previous rate, and tax exemption was extended to Mexican controlled firms producing molybdenum, bismuth, cadmium, arsenic, vanadium, selenium, iron, cobalt, or mixtures thereof.

In an effort to reduce smuggling mercury from Mexico, the Government reduced production and export taxes by 50 percent (from about $75 down to $37.50 per flask) for a trial period of one year beginning December 31, 1967. Industry sources reported immediate increased offerings of "legal" mercury.

It was expected that in 1968 the export tax on refined zinc bars would be reduced to the rate paid on zinc in concentrates.

According to 1967 figures, employment in mining, metallurgy, and petroleum increased by 28 percent over 1965 levels. Breakdown, by industry, for 1967 was as follows: Mining 90,000; metallurgy, 30,000; petroleum, 63,000.

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[1] Physical scientist, Division of International Activities.

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PRODUCTION

The Bureau of Mines has heretofore depended mainly on two sources for mineral production statistics, the annual mineral production questionnaires submitted by Embassy of United States of America, Mexico, D. F., and monthly figures published by the Mexican Government.[2] However, in 1967, another publication became available[3] that revised many figures previously published. As the work was done by the organization primarily responsible for mineral statistics, the revised figures were considered a more accurate reflection of actual output. Therefore, note should be taken of the numerous revisions and additions in respect of the production table.

In general, quantity output of selected metallic minerals in 1967 was down, but value was up—1966 ($306 million), 1967 ($315 million).[4] However, substantial gains were made in quantity of 1967 output over that of 1966 in iron ore, cadmium metal, bismuth and tungsten.

Mercury output for 1967 at 14,413 flasks was nearly 35 percent less than the 1966 quantity. However, smuggling from Mexico reportedly remained a problem, and some estimates indicated that as much as 30 percent of total output might not have been officially recorded. The Government's new policy reducing taxation for mercury production and export was expected to reduce illicit traffic in the metal.

Cía. Metalúrgica Mexicana Peñoles ceased production of selenium at its Monterrey plant in April 1966.

Output of crude petroleum in 1967 averaged 364,166 barrels daily. In addition, daily recovery of natural gasoline and condensate amounted to 46,585 barrels, for an average total daily petroleum output of 410,751 barrels. This was an increase of 11.03 percent over 1966 figures. Natural gas production at 1,569.4 million cubic feet per day was 8.5 percent higher than that of 1966.[5] Petróleos Mexicanos (Pemex) listed production of 22 basic petrochemical commodities in 1967 totaling 780,723 tons, 20.42 percent over 1966 output.[6]

The iron and steel industry had increased output, the rise over 1966 levels amounting to 11.1 percent for primary forms and ferroalloys. Sponge iron production, at 325,930 tons, was up 22.7 percent from the 1966 figure. Ferroalloy output alone gained 22.3 percent. A breakdown of Mexican ferroalloy production was as follows: Ferromanganese 35,690; ferrosilicon 11,068; silicomanganese 6,661; ferrochrome 1,075; and ferromolybdenum 118.

[2] Secretaría de Industria y Comercio, Dirección General de Estadística. Revista de Estadística.

[3] Consejo de Recursos Naturales no Renovables. Sumario Estadístico de la Minería Mexicana. Mexico, D. F., 1967, 428 pp.

[4] U.S. Embassy, Mexico City. Annual Minerals Industry Report, Mexico, 1967. State Department Airgram A-1066, June 23, 1968, 17 pp., 22 enc.

[5] Petrólecs Mexicanos Memoria de Labores. 1967. pp. 47–48.

[6] Page 60 of work cited in footnote 5.

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Table 1.—Mexico: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Aluminum:					
Ingots	5,500	17,678	19,088	20,902	21,513
Alloys	526	1,232	1,783	r 1,957	NA
Semifinished and finished products	13,297	14,179	15,650	NA	NA
Antimony:					
In untreated ore and concentrate	3,899	3,805	3,476	3,145	2,752
In smelter products	927	983	985	1,271	986
Total	4,826	4,788	4,461	4,416	3,738
Arsenic trioxide (As_2O_3)	13,305	14,860	13,778	r 13,746	15,423
Arsenic content (as reported)	9,486	11,169	10,127	10,103	11,336
Bismuth	r 400	r 500	r 465	470	504
Cadmium:					
In zinc concentrates for export e	2,149	2,250	2,028	r 838	378
In flue dust	681	659	681	NA	700
Refined metal	163	158	69	110	168
Copper:					
In ores mined [1]	r 55,090	r 52,072	r 55,248	r 56,513	56,012
Smelted and refined	r 53,660	r 50,243	r 54,008	55,238	54,457
Gold troy ounces	237,948	209,976	215,796	190,815	165,287
Iron ore, 60 percent Fe equivalent	2,328,137	2,320,778	2,654,560	2,307,030	2,695,160
Iron content (as reported)	1,396,882	1,392,467	1,592,737	1,384,218	1,617,096
Iron and steel:					
Pig iron	833,118	926,263	945,947	1,136,568	1,285,493
Sponge iron	169,735	202,551	212,668	265,575	325,930
Ferroalloys	25,917	42,568	43,436	44,657	54,612
Steel ingots	2,026,033	2,326,496	2,454,680	2,787,478	3,023,166
Steel castings	11,684	25,754	33,772	13,096	
Semifinished and finished steel	1,634,187	1,885,480	2,032,246	2,327,637	3,904,826
Lead:					
In ore and concentrate for export	2,804	3,254	2,473	2,100	2,223
In smelter and refinery products	186,170	166,703	164,307	172,145	161,690
Manganese, content of ore	77,786	85,953	83,574	51,624	30,799
Mercury 76-pound flasks	16,302	12,549	19,190	r 22,075	14,413
Molybdenum ores:					
Molybdenum sulfide (MoS_2) content kilograms	68,755	89,164	80,926	r 149,663	e 220,000
Molybdenum (Mo) content do	41,253	53,498	48,556	r 89,708	131,868
Nickel	26	29	444	55	28
Selenium r kilograms	2,874	3,166	8,227	1,711	
Silver thousand troy ounces	42,760	41,716	40,332	41,984	38,273
Strontium ore	r 6,276	r 5,461	r 2,620	r 5,685	2,543
Tin:					
In ores mined long tons	1,055	1,207	503	r 789	NA
Refined do	1,055	1,145	459	795	607
Tungsten ore, 60 percent WO_3 basis	33	8	183	143	313
Zinc:					
In ore and concentrate for export	151,454	158,558	143,131	132,272	139,648
In smelter and refinery products [2]	81,642	86,375	89,744	100,641	101,567
Nonmetals:					
Agate kilograms	717	6,484	150	21,005	3,000
Barite	256,597	334,044	368,342	291,484	223,280
Calcite:					
Optical kilograms	(5)	r 19	29	r 11	NA
Common	3,550	3,616	18,671	6,559	5,064
Cement:					
Gray	3,596,291	4,241,941	4,207,075	r 4,231,610	5,544,237
White	77,463	89,845	111,567	r 106,622	113,727
Other	88,318	86,323	3,497	r 568,982	e 600,000
Total	3,762,072	4,418,109	4,322,139	r 4,907,214	6,257,964
Clays:					
Kaolin	46,561	64,225	81,135	96,591	78,592
Bentonite	4,245	r 16,230	r 17,077	25,607	32,580
Fuller's earth	8,635	4,614	9,172	6,020	18,643
Refractory	369	987	382	3,259	98,049
Diatomite	888	2,050	895	8,461	7,186
Dolomite	r 120,749	r 239,551	r 266,690	305,680	349,890
Feldspar	14,500	31,900	47,700	82,700	63,600
Fertilizers:					
Nitrogenous	434,178	469,320	3 198,511	r 443,558	450,200
Phosphatic	161,332	164,055	165,530	r 200,149	231,600
Mixed	153,949	176,948	r 262,286	NA	NA
Other	41,451	86,515	NA	NA	NA
Fluorspar	481,619	642,872	735,381	725,388	785,114
Graphite, amorphous	r 18,303	30,337	40,413	r 38,752	40,690

See footnotes at end of table.

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Table 1.—Mexico: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Nonmetals:—Continued					
Gypsum	1,097,339	1,165,054	1,081,745	1,151,071	976,401
Limestone:					
For cement e thousand tons	4,780	5,640	5,595	NA	NA
Other do	r 1,232	r 1,433	r 1,590	r 1,727	1,693
Total e do	r 6,012	r 7,073	r 7,185	NA	NA
Marble	r 28,608	r 24,259	r 14,486	r 19,594	18,005
Mica	r 262	r 304	r 546	396	884
Perlite	r 6,407	r 8,962	r 8,350	10,095	10,572
Phosphate rock	r 34,292	r 33,124	r 39,473	r 55,788	54,264
Salt thousand tons	1,225	1,783	2,200	2,398	3,330
Sand, silica	154,978	r 257,397	192,986	205,864	203,065
Sodium sulfate	----------	189	26,113	47,895	68,757
Sulfur:					
Frasch processed	1,480,026	1,662,016	1,505,015	1,637,299	1,818,928
Mined	29,433	26,406	34,342	29,792	23,920
Recovered from natural gas	44,003	36,866	46,722	38,772	48,307
Total	1,553,462	1,725,288	1,586,079	1,705,863	1,891,155
Talc	r 1,317	r 785	r 3,387	r 2,510	2,918
Wollastonite	51	15,553	5,811	3,210	1,504
Mineral fuels:					
Bituminous coal thousand tons	2,071	r 2,138	2,006	2,101	2,388
Coal products:					
Coke do	765	786	824	r 865	1,084
Coke breeze (finos de coque)	21,265	21,138	20,874	r 21,819	NA
Coal tar	11,628	12,238	10,708	r 12,255	NA
Coal gas 4 million cubic feet	2,971	3,489	5,332	r 6,251	e 6,513
Natural gas 4 do	401,572	485,057	493,161	529,128	572,832
Sales 4 do	205,944	234,636	r 249,844	r 255,128	275,502
Petroleum:					
Crude (includes distillates and natural gas liquids) thousand 42-gallon barrels	125,825	129,504	132,141	135,021	149,924
Refinery products:					
Gasoline:					
Aviation do	648	695	791	663	639
Other (including naphthas) thousand 42-gallon barrels	33,860	36,002	37,674	36,646	40,984
Total do	34,508	36,697	38,465	37,309	41,623
Jet fuel do	786	955	1,070	1,605	1,984
Kerosine do	11,706	12,188	11,906	11,665	12,076
Distillate fuel oil do	16,995	20,682	21,020	21,771	23,746
Residual fuel oil do	42,511	39,953	41,880	40,320	43,428
Lubricants, including greases thousand 42-gallon barrels	1,220	1,270	1,409	1,342	1,394
Asphalt do	2,004	2,321	3,173	6,035	6,289
Liquefied petroleum gas do	5,793	6,734	8,452	8,569	9,152
Other do	2,261	2,252	2,519	4,547	2,472
Total refinery products thousand 42-gallon barrels	117,784	123,052	129,894	133,163	142,164

e Estimate. p Preliminary. r Revised. NA Not available.

1 Figures include electrolytic copper.

2 Includes refined bars, concentrated slag, zinc oxide, zinc sulfate, zinc residues, and calcined zinc.

3 Ammonium sulfate only.

4 Converted at 35.3145 cubic feet per cubic meter.

5 Revised to none.

TRADE

Value of trade in all commodities rose slightly from 1965 to 1966, but considerable variation in mineral trade value was recorded for the period. Value of 1966 mineral commodity exports declined by nearly 16 percent from the 1965 level, while value of mineral commodity imports rose by 117 percent. Imports of the following commodities showed the greatest percentage increases in quantity: Nickel, all forms, 94 percent; phosphate rock, 27 percent; asbestos, 19 percent; and tin in all forms, 14 percent.

Import value of 13 selected nonmetallic mineral commodities rose from $12.8 million in 1965 to $14.8 million in 1966.

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Export value of selected important mineral commodities for 1966 were as follows, with 1965 value in parentheses: Zinc, $63.4 million ($63 million); silver, $44.2 million ($38 million); sulfur, $35.4 million ($34 million); lead, $34.4 million ($36 million); fluorite, $15.3 million ($16 million); copper, $5.6 million ($4 million).

On a value basis, the United States remained Mexico's primary trading partner in 1966, taking 62.5 percent of total commodity exports, and supplying 63.8 percent of imports; West Germany supplied 7.7 percent of Mexico's commodity imports, while Japan received 9.6 percent of its exports.

The following table shows the relation of total commodity trade to trade in mineral commodities for 1965 and 1966:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports			
1965	$301.0	$1,111.0	27.1
1966	253.4	1,192.4	21.3
Imports			
1965	71.9	1,559.6	4.6
1966	156.1	1,605.2	9.7
Trade balance			
1965	229.1	−448.6	XX
1966	97.3	−412.8	XX

XX Not applicable.
Source: Anuario Estadístico del Comercio Exterior de los Estados Unidos Mexicanos.

Table 2.—Mexico: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Alumina	(1)	6	Mainly to United States.
Ingots	429	600	Mainly to Colombia.
Semimanufactures	6	12	Mainly to El Salvador.
Antimony, content of:			
Ore and concentrate	11,349	14,493	Mainly to United States.
Mixed bars	234	177	Do.
Refined bars	46	145	All to United States.
Arsenic oxide:			
Black arsenic	826	1,638	Do.
White arsenic	9,209	9,409	Do.
Total	10,035	11,047	
Bismuth:			
Mixed bars	415	276	United States 142; United Kingdom 133.
Refined bars	147	245	Mainly to United States.
Cadmium:			
Flue dust	944	1,062	All to United States.
Refined metal	26	65	Brazil 34; United States 29.
Copper:			
Ore	5,753	4,499	All to United States.
Concentrate, precipitate, matte, speiss, etc.	989	1,243	United States 654; Japan 589.
Sulfate	997	1,298	Mainly to Brazil.
Metal:			
Mixed bars	7,947	7,278	United States 5,978; Poland 1,300.
Anodes and electrolytic copper	837	250	All to United States.
Semimanufactures, including alloys	3,592	4,801	Mainly to United States.
Gold—troy ounces	5,919	7,196	Do.
Iron and steel:			
Iron ore	9,914	120	Do.
Scrap	372	98	All to United States.
Pig iron	(1)	-------	
Steel:			
Ingots and other primary forms	4	10	Do.
Semimanufactures:			
Bars	259	200	Mainly to Argentina.
Plates, sheets and strip	90,528	78,658	Mainly to United States.
Tinplate	50	60	Do.
Girders, beams, structural shapes	871	1,113	Mainly to Costa Rica.
Wire and cable	802	793	Chile 352; Colombia 237.
Pipes, tubes, and fittings	44,083	44,780	United States 26,049; Colombia 8,738.
Other	926	938	All to United States.
Lead:			
Ore, concentrate, matte, and speiss	2,818	2,493	Mainly to United States.
Oxides:			
Litharge	31,011	28,923	Do.
Red lead	2,352	2,622	United States 1,154; West Germany 530.

See footnotes at end of table.

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Table 2.—Mexico: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Lead—Continued			
Metal:			
Impure and mixed bars	10,366	15,232	Netherlands 8,124; United States 4,579.
Antimonial bars	74	129	Mainly to United States.
Refined bars	96,727	98,559	Do.
Manganese ore and concentrate	88,260	40,606	Do.
Mercury—76-pound flasks	19,326	19,538	Do.
Molybdenum concentrate	108	65	West Germany 27; United States 24.
Silver—thousand troy ounces	29,522	34,245	West Germany 14,801; United States 11,897.
Tungsten concentrate	204	223	Mainly to United States.
Zinc:			
Ore, concentrate, slag, and other intermediate products.	285,003	312,934	Do.
Oxide, white	6,531	7,987	Do.
Sulfate	1,449	1,049	All to United States.
Metal:			
Powder	-------	1,339	Mainly to Argentina.
Refined bars	25,861	32,606	United States 16,928; Brazil 8,472.
Other metals and metallic residues	685	483	United States 280; Belgium 203.
Nonmetals:			
Abrasives, except diamond, not elsewhere specified:			
Emery—kilograms	571	2,092	Mainly to Guatemala.
Pumice	7,180	6,723	All to United States.
Asbestos	106	21	Mainly to Switzerland.
Barite	220	192	Mainly to United States.
Calcite, optical and industrial—kilograms	-------	175	Do.
Cement, portland	1,939	1,956	Do.
Clays and earths:			
Bentonite	405	65	United States 44; West Germany 20.
Other clays including refractory	300	282	United States 116; Venezuela 60.
Earths, all kinds	73	4	United States 2; Guatemala 1.
Diamond:			
Gem—carats	1,060	-------	
Industrial—do	15,000	15,000	All to Guatemala.
Diatomite, infusorial earth, tripoli, and chalk.	5,694	3,628	United States 807; Belgium 407; United Kingdom 324.
Feldspar	57	779	All to Guatemala.
Fluorspar:			
Acid grade	219,700	241,765	Mainly to United States.
Metallurgical grade	461,438	501,429	United States 385,364; Canada 115,600.
Gem stones, cut and uncut—carats	785	20,228	Mainly to Spain.
Graphite, natural amorphous	37,463	31,173	Mainly to United States.
Gypsum:			
Crude	1,075,865	979,614	United States 800,640.
Calcined	81	22	Mainly to Colombia.
Lime	45	17	British Honduras 10; United States 7.
Limestone and dolomite	950	495	All to United States.
Perlite	488	1,392	Chile 715; Guatemala 343.
Phosphate rock	31,319	37,053	Mainly to United States.
Quartz	1,747	1,304	All to United States.
Salt—thousand tons	1,601	850	United States 516; Canada 227.
Stone, sand, and gravel, building and industrial:			
Alabaster and marble	5,711	10,305	Mainly to Philippines.
Granite	20	-------	
Other stone, type not specified	43,425	-------	
Sand and gravel	8,377	8,092	United States 4,050; Guatemala 4,011.
Strontium minerals, celestite	3,125	6,302	Mainly to United States.
Sulfur—thousand tons	1,540	1,504	Bahamas 687; United States 258.
Talc and steatite	41	18	Mainly to United States.
Mineral fuels:			
Asphalt	121	240	Mainly to Costa Rica.
Coal, powdered	2	9	Guatemala 5; United States 4.
Natural gas—million cubic feet	54,327	16,096	All to United States.
Natural gas liquids	371	828	Mainly to United States.
Petroleum:			
Crude—thousand 42-gallon barrels	7,266	10,183	All to United States.
Refinery products:			
Gasoline—do	8	82	Mainly to United States.
Distillate fuel oil—do	271	442	Denmark 264; United Kingdom 126.
Residual fuel oil—do	10,170	7,255	Mainly to United States.
Lubricants, including greases	260	261	Do.
Paraffin	2,829	964	All to United States.

[1] Less than ½ unit.

Sources: Secretaría de Industria y Comercio, Dirección General de Estadística. Anuario Estadística del Comercio Exterior de los Estados Unidos Mexicanos. 1966, 739 pp.; 1967, 746 pp.

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Table 3.—Mexico: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	14,987	9,888	Mainly from United States.
Aluminum oxide	45,982	44,190	Do.
Metal, all forms	4,479	1,301	Do.
Antimony, all forms	---	59	United States 39; Belgium 17.
Cobalt, oxide	8	3	Belgium 2; United States 1.
Copper and alloys, all forms	795	723	United States 320; West Germany 282.
Chromite	27,543	23,154	Mainly from United States.
Gold:			
Wire---troy ounces	4	1	All from United States.
Sheets---do	1,370	1,730	Mainly from West Germany.
Powder---do	13,628	16,396	All from United States.
Iron and steel:			
Iron ore	18,527	419	Mainly from Brazil.
Pig iron, sponge, powder	r 31,777	36,273	Mainly from United States.
Scrap	751,904	720,678	Do.
Ferroalloy	1,535	1,294	Do.
Ingots and equivalent forms	r 29,572	59,208	Do.
Semimanufactures:			
Railroad rails and accessories	r 138,396	109,760	Canada 69,991; United States 26,017.
Other	33,739	36,034	Mainly from United States.
Lead, all forms	27	39	Do.
Magnesium	525	654	Do.
Mercury---76-pound flasks	30	23	Do.
Nickel:			
Ingots and castings	208	94	Canada 69; United States 25.
Semimanufactures	344	978	United States 610; Canada 253.
Palladium---troy ounces	3,261	5,746	All from United States.
Platinum---do	1,174	3,503	Mainly from United States.
Rutile	795	336	United States 236; Australia 100.
Silver:			
Wire---troy ounces	6,311	10,276	United States 9,615; United Kingdom 458.
Bars and shapes---do	1,398	703	West Germany 349; Belgium 322.
Other---do	552	1	All from United States.
Tin:			
Tin ore---long tons	761	1,004	United States 420; Bermuda 394.
Ingots---do	539	480	All from United States.
Semimanufactures---do	24	26	Mainly from United States.
Tungsten, all forms	7	---	
Uranium, thorium, plutonium and other substances.	11	5	Do.
Zinc, all forms	60	63	United States 34; West Germany 10.
Zircon	1,854	1,550	Mainly from Australia.
Other: [1]			
Ores and concentrates	15	48	Australia 27; United States 15.
Metals and alloys	28	15	Mainly from United States.
Scrap of nonferrous metals [2]	10	94	Do.
Nonmetals:			
Abrasives:			
Carborundum and emery in powder and grains.	433	680	United States 248; Austria 219.
Asbestos, crude	21,480	25,526	Mainly from Canada.
Barite	644	452	West Germany 192; United States 187.
Cement	8,887	6,175	Mainly from United States.
Clays:			
Fuller's earth	3,369	485	Do.
Kaolin	9,096	13,413	Do.
Refractory	86,327	90,240	Do.
Other	r 1,011	1,752	Do.
Cryolite, natural or artificial	272	380	Do.
Diamond:			
Gem, cut and uncut---carats	8,005	13,580	Netherlands 6,900; Belgium 3,275.
Industrial---do	1,400,000	50,000	Mainly from United States.
Powder---do	r 1,100,000	85,000	All from United States.
Diatomite	274	80	Mainly from United States.
Dolomite	70	50	All from United States.
Feldspar	1,058	1,462	Do.
Fertilizer and fertilizer raw materials:			
Nitrogenous:			
Sodium nitrate	13,192	14,535	Mainly from Chile.
Ammonium nitrate	49,742	24,779	United States 20,180; Costa Rica 4,598.
Phosphatic:			
Phosphate rock	228,190	289,771	Mainly from United States.
Superphosphates	---	3	All from United States.
Potassic: Potassium chloride	31,474	40,775	Mainly from United States.
Gem stones, rough or cut.---kilograms	55	88	Brazil 60; France 19.

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Table 3.—Mexico: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Graphite	270	133	United States 68; Canada 50.
Gypsum, calcined	r 9,467	8,773	Mainly from United States.
Magnesite, calcined	35,589	39,865	Do.
Marble, crushed, crude and cut	41	601	Mainly from Italy.
Mica:			
Crude and powder	128	197	Mainly from United States.
Scrap	36	42	All from United States.
Salt	4,822	1,131	Mainly from United States.
Sand and gravel	136,648	132,397	Do.
Stone:			
Building and ornamental	2,808	2,216	Mainly from Italy.
Sulfur, ground and unground	403	165	Mainly from United States.
Talc and pyrophyllite:			
Talc:			
Crude	34,150	46,648	Do.
Powdered	613	618	Do.
Pyrophyllite	150	83	All from United States.
Vermiculite	564	577	Mainly from United States.
Other nonmetallic minerals	1,247	2,546	Australia 1,621; United States 923.
Mineral fuels:			
Coal	56,303	63,796	Mainly from United States.
Coke	56,250	124,807	Do.
Natural gas—million cubic feet	8,252	8,809	All from United States.
Natural gas liquids—thousand 42-gallon barrels	5,650	6,659	Mainly from United States.
Petroleum:			
Crude	1,057	633	Do.
Refinery products:			
Aviation gasoline—do	107	282	Do.
Motor gasoline—do	287	1,241	Do.
Kerosine—do	[3] 272	107	Do.
Distillate fuel oil—do	166	(4)	All from United States.
Residual fuel oil—do	1,669	318	Do.
Lubricants including greases	190	257	Mainly from Uinted States.
Asphalt	358	594	All from United States.
Paraffin and vaseline	23,749	25,202	Mainly from United States.

r Revised.
[1] Molybdenum and various alloys.
[2] Copper, brass and tin.
[3] Includes jet fuel.
[4] Less than ½ unit.

Sources: Secretaría de Industria y Comercio, Dirección General de Estadística. Anuario Estadística del Comercio Exterior de los Estados Unidos Mexicanos. 1966, 739 pp.; 1967, 746 pp.

COMMODITY REVIEW

METALS

Aluminum.—Aluminio, S.A. de C.V., announced plans to double ingot capacity to 40,000 tons per year. Expansion of the Veracruz [7] plant was planned in two phases, the first step to 30,000 tons annual capacity, with 40,000 tons capability to be achieved in early 1970. Total cost of the program was reported at $19.2 million. Aluminio, S. A., de C. V., was under the following ownership: Mexican interests, 51 percent, Aluminum Company of America, 35 percent, and American and Foreign Power Co., Inc., 14 percent.

In 1966, Reynolds Metals Co. announced [8] that it was seeking a license to establish a primary aluminum reduction plant near Mexico City.

American & Foreign Power Company, Inc., invested $1 million for a one-half [9] interest in Kawneer de Mexico, S.A. de C.V., a subsidiary of American Metal Climax, Inc. Kawneer, an established manufacturer of aluminum building products, started construction of an extrusion facility near Puebla.

Production of alumina from alunite, $KAl_3(OH)_6(SO_4)_2$, was reportedly successful on an experimental basis and the

[7] Metals Week. V. 166, No. 5, Jan. 30, 1967, p. 3.
[8] American Metal Market. v. 73, No. 25, Feb. 4, 1966, pp. 1, 3.
[9] Mining Journal. v. 268, No. 6856, Jan. 13, 1967, p. 36.

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Mexican Development Bank was to provide funds for construction of a plant[10] in the State of Guanajuato near the alunite reserves. Initial annual production was to be 10,000 tons.

Copper.—Cía. Minera de Cananea, S.A. de C.V. (owned 99.9 percent by the Anaconda Company), continued expansion at its copper producing facilities in Sonora. Concentrator capacity was increased to 22,500 tons daily and the mile-long underground conveyor system was completed. Average copper content of ore was reported at 0.5 percent. Planned expansion called for output of 68,000 tons of copper metal annually by 1972–73, double the planned production for 1968.

Cía. Minera Trion, S.A. de C.V. was formed jointly by Cía. Minera Mexicana Peñoles, S.A. (51 percent), Homestake Mining Co., and Minera Continental, S.A. (24.5 percent each), to appraise a reportedly large porphyry copper deposit near Hermosillo, Sonora; grade is said to be 0.6 percent copper.

Lytton Minerals Ltd., a Canadian firm, formed Minas Del Onono to acquire an option[11] on the old Verde Copper Mine in Michoacan. The prospect was being thoroughly studied, and some ore averaging more than 1 percent copper had been discovered at yearend 1967.

Iron Ore, Iron and Steel.—At yearend 1967 the Mexican Government announced the formation of a consortium[12] to develop the Peña Colorada iron ore deposits in Colima. The initial capital of $8.4 million was contributed as follows: Federal Government, $400,000; Altos Hornos de México, $4 million; Hojalata y Lámina, $2.4 million; Tubos de Acero de México, $1.2 million; and Cía. Fundidora de Fierro y Acero de Monterrey, S.A. $400,000. Reserves were reported to be 130 million tons of 60 percent Fe ore, carrying 2.4 percent sulfur.

Cía. Fundidora de Fierro y Acero de Monterrey, S.A., continued efforts to increase ingot steel capacity to 800,000 tons by 1968. Financing for further modernization, investment, and working capital was underwritten to the extent of an additional 1.5 million common shares by the International Finance Corporation and Credito Bursatil. Shares of par value of $8.00 will be offered at $9.60 to stockholders on a basis of two new shares for each seven shares held.[13] This firm also was installing a small heavy media separation plant at its Cerro del Mercado iron ore deposit in Durango to treat weathered float ore at the rate of 45 tons per hour. Startup was scheduled for mid-1968. Lack of water was a problem, and exploratory drilling was initiated to find adequate supplies.

DEMAG A.G., a West German firm, announced that it would deliver steelmaking equipment and rolling facilities to Cía. Siderúrgica de Guadalajara, S.A. The plant was designed for a capacity of 47,000 tons per year; production was scheduled for late 1969.

Hojalata y Lámina, S.A., let contracts in 1967 for a pelletizing plant to be engineered by Lurgi, A.G. The 1-million-ton-per-year plant will treat ore from the company's deposit in Los Encinas, Colima. Total investment was estimated at about $14.5 million.

Lead and Zinc.—At yearend 1967, Cía. Metalúrgica Mexicana Peñoles, S.A. was preparing to invest some $34 million for Mexico's[14] first Imperial Smelting Process plant. The smelter, to be built at Torreón, Coahuila, was planned to produce 100,000 tons of zinc and 40,000 tons of lead annually. Final negotiations between the company and the Mexican Government were still in progress at yearend.

Uranium.—The National Commission of Atomic Energy decided to establish Mexico's first uranium treatment plant at Villa Aldama, Chihuahua.[15] About $1 million has been expended in the study of uranium deposits in that State.

NONMETALS

Cement.—According to the Cámara Nacional del Cemento, 26 cement plants were operating in Mexico in 1967. Total

[10] Mining Journal. v. 267, No. 6847, Nov. 11, 1966, p. 374.
[11] World Mining. v. 4, No. 6, June 1968, p. 45.
[12] Comercio Exterior de México. February 1968, p. 17.
[13] International Finance Corporation. News Release No. 68/3, Mar. 11, 1968.
[14] Engineering and Mining Journal. V. 169, No. 4, April 1968, p. 168.
[15] World Mining. V. 4, No. 6, June 1968, p. 45.

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installed capacity was 24,020 tons daily. Five plants were planned with total proposed capacity of 4,900 tons per day. With present and planned capacity operational, estimated output was rated at 8,676,000 tons annually, a 70 percent increase over 1965 capacity of 5,100,000 tons.

Fluorspar.—Asarco Mexicana, S.A. was nearing completion of its acid grade fluorspar recovery plant at Parral, Chihuahua. The plant will operate on a stockpile of tailings containing 15 percent calcium fluoride that was accumulated over the years from lead/zinc operations.[16] Costing $3.5 million, planned plant capacity was reported at 77,000 tons of concentrate annually.

Cía. Fluorita del Centro, S.A., was newly organized to develop fluorspar deposits near San Luis Potosí. It was planned to increase output from 200 to 700 tons per week.

Sulfur.—Cía. Azufrera Panamericana, S.A. de C.V., a wholly owned subsidiary of Panamerican Sulphur Co., was Mexicanized in mid-1967 with sale of 66 percent of the interest, for a reported $49.5 million, to private Mexican investors, the Nacional Financiera, and the Banco de México.

Texas Gulf Sulphur Co. was also Mexicanized in 1967. The newly formed Cía. Exploradora del Istmo, S.A. de C.V., was producing Frasch sulfur by October 1967, after plant renovation.

At yearend 1967, some buyer resistance for sulfur at $55 per ton F.O.B. Coatzacoalcos was reported. Stocks had increased to 484,708 tons.

Vigorous exploration efforts have increased proven reserves to nearly 45 million tons, double the known reserves at yearend 1964.[17]

MINERAL FUELS

Petróleos Mexicanos (Pemex) had a successful year and showed gains in nearly all phases of activity. Combined production of crude, distillate, and natural gasoline amounted to 149.9 million barrels, a rise of 11 percent over that of the preceding year. Output of refinery products also rose 11 percent over that of 1966.

During 1967, Pemex reported the completion of 102 separate expansion projects, while at yearend 1967, another 169 projects were under construction.

Pemex completed 135 test wells in 1967; of these, 24 produced oil and 13 produced gas. With respect to development wells, 364 were drilled in 1967. Of the total of 499 wells (test and development) completed in 1967, 208 were oil wells, and 90 were gas wells, with a success ratio of nearly 60 percent.

The only offshore well completed in 1967 was the Arenque No. 1. Considerable importance was attached to the discovery of oil in the lower Cretaceous section as an indicator of conditions similar to those in the Tamaulipas-Constituciones and Barcodón fields.

Pemex reported hydrocarbon reserves at yearend 1967 of 5,486 million barrels. Of this total, crude oil accounted for 2,209 million barrels, condensate for 407 million, and gas, (converted to barrels) 2,370 million.

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[16] Engineering and Mining Journal. v. 169, No. 3, March 1968, pp. 218, 220.
[17] Mining Journal. v. 270, No. 6914, Feb. 23, 1968, p. 145.

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The Mineral Industry of Morocco[1]

By Henry E. Stipp[2]

Morocco's mineral industry showed little progress in 1967. The $160 million value of mineral production (not including petroleum refinery products) accounted for over 6 percent of the nation's gross national product of $2,587 million.[3] Employment by the minerals industry totaled 29,711 persons, about 0.6 percent of the Nation's total labor force of 4.5 million. Of these workers, 13,253 were employed by the phosphate section of the industry. Other sectors that employed significant numbers of workers were lead and zinc 4,198; coal 4,127; iron ore 2,453; and manganese ore 2,237.

Morocco maintained its position as the world's second leading producer of phosphate rock after the United States and the world's leading exporter of phosphate rock. The country continued to rank high in free world production of cobalt.

A World Bank mission that suveyed Morocco's economy suggested an expansion of phosphate rock mining and an increase of local capacity to transform the phosphate rock into fertilizer.[4]

The Government of Morocco's budget for 1967 allotted over $6.8 million or 4 percent of the total national budget of almost $171 million for investment in the industrial and mining sector of the country. Investment in the Safi Chemical Complex was scheduled at about $3.5 million.

In October the Government created an interministerial Atomic Energy Commission under the presidency of the Prime Minister of Morocco.[5] The commission is responsible for promoting programs for utilization of atomic energy, and for coordinating these programs in various fields.

PRODUCTION

Production of mineral commodities decreased over 4 percent in value to $160 million from $166 million in 1966. Production of phosphate rock, which accounted for 66 percent of the total output value rose over 5 percent in quantity in 1967 compared with 1966 output, reversing the downward trend of the previous 2 years. This was probably the result of larger output from the Mersa El Arech open pit operation in the Khouribga area. Production of phosphate rock and its products should continue to increase in response to the development of a third mine north of Marrakesh and also because of the countrys large proven reserves. The sharp and persistently increasing output of pyrrhotite (25 percent over that of 1966) was noteworthy. This mineral is used at the Safi Chemical Complex to manufacture sulfuric acid, which is consumed in producing phosphate fertilizer compounds, such as triple superphosphate and ammonium phosphate. Output of these products has been increasing as a result of greater domestic use of fertilizer compounds and expanding development of foreign markets. Production of nonferrous metals was down slightly from the high output recorded in 1966 despite the fact that

[1] Much information for this chapter was provided by Walter A. Hayden, U.S. Embassy, Rabat, Morocco.

[2] Physical scientist, Division of International Activities.

[3] Where necessary, values have been converted from dirhams (DH) to U.S. dollars at the rate of DH 5.06=US $1.00.

[4] Finance and Development, Developing Morocco's Economy. V. 111, No. 1, March 1966, p. 21.

[5] U.S. Embassy, Rabat, Morocco. State Department Airgram A-90, Nov. 3, 1967, p. 3.

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world prices for a number of these minerals remained stable or increased.

In early 1967 the second largest manganese mine in the country closed down and there was an associated decline in national output. The Government assumed control of the country's only producing iron mines (near Nador), reportedly as a step in establishing an integrated steel industry in the area; ore output declined for unspecified reasons. Crude oil production decreased about 45,000 barrels compared with that of 1966, continuing the generally downward trend resulting from the depletion of the country's limited reserves. The search for new petroleum reserves by government agencies and private industry was intensified with ex-

Table 1.—Morocco: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Antimony concentrate:					
Gross weight	1,742	3,282	4,586	2,685	3,178
Metal content	675	1,560	2,200	1,343	1,589
Cobalt concentrate:					
Gross weight	13,707	15,253	16,654	18,130	17,530
Metal content	1,371	1,678	1,832	1,994	1,928
Copper concentrate:					
Gross weight	6,119	6,504	6,278	8,940	8,421
Metal content	1,806	1,748	1,813	2,682	2,526
Iron ore—thousand tons	1,035	888	951	1,017	884
Lead:					
Concentrate:					
Gross weight	106,073	103,944	113,259	119,380	116,336
Metal content	73,972	71,290	77,111	77,597	52,351
Smelter	18,760	18,839	17,232	18,775	21,359
Manganese ore:					
Metallurgical	266,051	266,400	321,429	284,660	197,753
Chemical	68,897	74,678	54,452	77,760	88,385
Nickel, content of cobalt ore [e]	274	336	360	390	NA
Silver—thousand troy ounces	773	604	599	707	773
Tin:					
Metal content of ore—long tons	9	14	12	7	6
Smelter [e]—do	10	10	12	12	[e] 11
Zinc concentrate:					
Gross weight	58,618	80,974	95,015	94,249	82,766
Metal content	33,038	42,346	51,218	53,722	45,521
Metallic oxides, mainly for pigment	869	864	910	544	NA
Nonmetals:					
Barite	94,554	89,844	103,880	106,255	90,518
Cement—thousand tons	759	927	790	857	858
Clays:					
Smectite and bentonite	37,637	32,289	51,760	40,950	33,361
Other, including fuller's earth	2,959	4,305	6,789	2,480	4,015
Fertilizer materials:					
Phosphate rock—thousand tons	8,548	10,098	9,824	9,439	9,945
Fluorspar	6,350	6,570	3,000	[e] 3,000	-------
Gypsum [e]—thousand tons	40	50	70	80	90
Pyrite, including cupriferous	23,142	21,220	18,318	14,896	-------
Pyrrhotite	-------	-------	128,014	282,311	353,153
Salt—thousand tons	37	61	34	39	20
Mineral fuels:					
Coal, anthracite—thousand tons	404	400	419	451	482
Fuel briquets—do	18	18	18	[e] 20	[2]
Natural gas, marketed—million cubic feet	436	443	425	411	379
Petroleum:					
Crude—thousand 42-gallon barrels	1,140	910	782	783	738
Refinery products:					
Gasoline—thousand 42-gallon barrels	2,189	1,442	2,072	2,074	2,178
Kerosine—do	602	490	504	518	506
Distillate fuel oil—do	2,457	2,187	2,532	3,264	3,078
Residual fuel oil—do	1,933	2,345	2,438	3,024	2,897
Other, mainly liquefied petroleum gas—thousand 42-gallon barrels	457	[e] 712	352	379	477
Total—do	7,638	[e] 7,176	7,898	9,259	9,136

[e] Estimate. NA Not available.

[1] In addition to commodities listed, Morocco also produces small quantities of copper matte from lead smelting, phosphatic fertilizer, and various quarry products, but production data are not available.

[2] Included with coal.

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ploration of the continental shelf off southern Morocco by a subsidiary of Standard Oil Co. of New Jersey. So far the search for new petroleum deposits has been unsuccessful except for discovery of natural gas near Kenitra. The deposit was being studied for possible commercial exploitation. Production of natural gas from deposits at Essauira was scheduled for 1967. Office Cheriffiene des Phosphates (OCP) will use the gas for fuel to manufacture phosphate fertilizers at Youssoufia.

TRADE

The mineral commodity trade balance of Morocco continued to be favorable during 1965 and 1966, whereas the nation's total trade balance remained in deficit. The principal reason for the large improvement in the 1966 mineral commodity trade balance compared with that of 1965 was the sharp reduction in imports of iron and steel semimanufactured products. The relationship between trade in mineral commodities and total trade is shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	168	430	39.1
1966	166	428	38.8
Imports:			
1965	63	453	13.9
1966	43	478	9.0
Trade balance:			
1965	+105	−23	XX
1966	+123	−50	XX

XX Not applicable.
[1] Values given are for those commodities listed in tables 2 and 3 of this chapter, together with gold in all forms including plate.

France continued to be Morocco's principal trading partner in 1966 furnishing 39 percent of total imports and receiving 42 percent of total exports. The United States shipped 12 percent of Morocco's total imports, but purchased only a little more than 2 percent of that country's total exports. West Germany was the third largest trading partner with over 6 percent of Morocco's total imports and 8 percent of her total exports. France also was Morocco's leading trading partner in mineral commodities, purchasing almost 19 percent of the African nation's phosphate rock exports in 1966 as well as a major share of its nonferrous ores and concentrates. France supplied Morocco with the principal portion of 1966 iron and steel semimanufactured products as well as large quantities of cement, chalk, borate, and nitrogenous fertilizer materials. The U.S. metals and minerals trade with Morocco was minor. Barite was the largest mineral import from Morocco; the United States received over 53 percent of total Moroccan shipments. Other mineral commodities traded included scrap iron and steel exports to Morocco and modest imports of Moroccan zinc concentrates and manganese ore. The U.S. principal exports to Morocco were agricultural products, mining equipment, motor vehicles, electric power machinery and other manufactured products.[6] Morocco imported large quantities of crude oil in 1967 principally from the U.S.S.R., Algeria, and Saudi Arabia.

[6] International Commerce, Morocco. V. 73, No. 2, Jan. 9, 1967, p. 60.

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Table 2.—Morocco: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Metal and alloys, all forms [1]	514	594	Italy 425; West Germany 145.
Antimony concentrate	r 2,739	3,220	France 1,109; Belgium-Luxembourg 938; Spain 310.
Cobalt concentrate	6,250	19,535	France 11,545; China, mainland 4,000; Belgium-Luxembourg 3,990.
Copper:			
Ore and concentrate	5,782	7,652	Poland 4,427; West Germany 2,133; China, mainland 1,092.
Matte	345	42	All to West Germany.
Metal and alloys, all forms [1]	1,088	1,528	Italy 360; West Germany 352; France 260; Netherlands 195.
Iron and steel:			
Ore—thousand tons	957	790	United Kingdom 218; Spain 210; West Germany 161.
Pyrite cinder	14,082	14,600	West Germany 6,900; Spain 4,670; Sweden 1,750.
Scrap	32,137	28,257	Italy 19,851; Japan 5,232; Spain 1,497.
Ferroalloys	15	22	All to France.
Semimanufactures	132	407	Cuba 114; Algeria 92; France 56; Italy 51.
Lead:			
Concentrate	145,205	91,998	France 42,978; Italy 14,674; Belgium-Luxembourg 13,670.
Unwrought and scrap	14,243	15,577	France 15,376; Spain 201.
Magnesium and alloys, ingot and scrap.	-------	3	All to United States.
Manganese ore—thousand tons	321	294	France 174; United States 42; Czechoslovakia 17.
Silver and alloys, unworked. thousand troy ounces	NA	e 4,000	France 2,100; Spain 1,900.
Zinc:			
Concentrate	98,148	80,007	France 57,050; United States 15,024; West Germany 5,051.
Semimanufactures	15	-------	
Ore and concentrate, n.e.s	6,854	1,827	France 1,827.
Metallic slags and residues, n.e.s	2,123	1,485	France 817; Greece 368; West Germany 300.
Metallic oxides, mainly for paint	689	433	France 428.
Nonmetals:			
Barite	107,939	98,303	United States 52,674; United Kingdom 14,550; Belgium-Luxembourg 8,800.
Cement	36,568	20,036	Spain 18,406; United Kingdom 1,500.
Clays and clay products:			
Bentonite	6,157	112	United Kingdom 107.
Fuller's earth	NA	1,344	Tunisia 1,266; Algeria 47; Togo 30.
Refractory	4,128	1,753	Spain 1,584; Cuba 169.
Smectic	22,308	28,123	France 17,736; Spain 10,387.
Other	2,385	-------	
Construction materials	7,405	32	Gibraltar 27; West Germany 3; Algeria 2.
Fertilizer materials: Crude:			
Guano	-------	3,631	Guiana 2,022; Guadeloupe 700; Nigeria 383; Martinique 380.
Phosphate rock—thousand tons	9,549	9,203	France 1,738; Belgium-Luxembourg 965, United Kingdom 825; Spain 803; China, mainland 579; Netherlands 500.
Manufactured, phosphatic	265	139,151	North Korea 39,652; South Korea 29,999; Bulgaria 21,300.
Fluorspar	1,445	-------	
Gypsum and anhydrite	34,908	49,554	Japan 26,564; Portugal 16,105; Senegal 5,885.
Lime	3,636	239	Spain 233.
Pyrite, crude	3,951	-------	
Salt and saline solutions	5	1	All to Gibraltar.
Stone, sand and gravel:			
Sand, mainly industrial	21,470	16,312	Spain 16,187; France 125.
Stone, crushed and broken	141	96	United Kingdom 64; Canary Islands 12; Italy 10.
Stone, dimension and other	63,831	7,732	Italy 3,192; Spain 2,431; Belgium-Luxembourg 1,510.
Sulfur, crude	NA	104	Spain 100.
Minerals and chemicals, n.e.s	5	1,547	Spain 1,031; France 254; Senegal 165.
Mineral fuels:			
Coal, anthracite and briquets. thousand tons	r 75	28	Algeria 8; Italy 7; France 6.
Coke and semicoke	NA	20	All to Algeria.

See footnotes at end of table.

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Table 2.—Morocco: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Mineral fuels—Continued			
Petroleum refinery products: [2]			
Gasoline			
thousand 42-gallon barrels	2	16	All to bunkers.
Kerosine do	4	72	Do.
Distillate fuel oil do	299	(3)	Do.
Residual fuel oil do	1	2	Do.
Lubricants do	-------	(3)	
Liquefied petroleum gas do	-------	(3)	
Total do	306	90	

e Estimate. r Revised. NA Not available.
[1] Includes scrap, ingots, and semimanufactures.
[2] Excludes exports and reexports of fuel oils from Ceuta and Melilla (Spanish enclaves), mainly from bunkers.
[3] Less than ½ unit.

Table 3.—Morocco: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	2,502	1,000	All from France.
Metal and alloys, all forms [3]	1,635	1,614	France 1,376; United States 92; Italy 34.
Antimony, unwrought	12	15	China, mainland 10; France 3; U.S.S.R. 2.
Copper and alloys, all forms [3]	2,123	2,343	France 1,773; United Kingdom 246; Italy 150; Yugoslavia 114.
Iron and steel:			
Scrap	77	82	United States 75; Italy 7.
Pig iron and ferroalloys [4]	1,237	1,314	West Germany 700; France 593.
Blooms and slabs	1,349	-------	
Semimanufactures	136,766	14,339	France 12,081; Czechoslovakia 488; West Germany 276; Belgium-Luxembourg 203.
Lead ore	121,378	-------	
Lead and alloys, all forms [3]	51	62	France 47; Denmark 9; United States 6.
Manganese ore	114	20	All from West Germany.
Mercury 76-pound flasks	7	14	Spain 7; France 4; United States 2.
Molybdenum, unwrought kilograms	-------	45	All from United Kingdom.
Nickel and alloys, all forms [3]	292	232	Italy 210; France 9.
Silver and alloys, all forms [3] troy ounces	707	e 632	Mainly from France.
Tin long tons	203	142	Malaya 135.
Zinc	739	834	France 328; Belgium-Luxembourg 280; Yugoslavia 75.
Nonferrous ores, n.e.s. thousand tons	-------	1,809	All from France.
Metallic slags and residues, pyrite cinders.	449	1,000	All from Spain.
Metallic oxides, mainly for paint	1,231	1,662	France 1,139; West Germany 433.
Nonmetals:			
Abrasives, natural	12	40	Canary Islands 13; France 13; Cameroon 12.
Asbestos	2,682	2,494	Sterling areas 1,057; Central African Republic 790; Southern Rhodesia 381; Canada 259.
Barite	4	1	All from France.
Borate, natural	418	537	France 402; Italy 135.
Cement	7,291	7,075	France 4,832; Belgium-Luxembourg 1,750; Czechoslovakia 250.
Chalk	2,670	3,143	France 2,748; West Germany 168; Italy 150.
Clays and clay products:			
Bentonite	4	-------	
Fuller's earth	84	11	Mainly from France.
Kaolin and refractory	15,701	16,300	Guiana 6,756; United Kingdom 4,738; France 4,722.
Smectic	4,907	38	Mainly from Algeria.
Other	672	624	All from France.
Construction materials	3,939	3,937	France 1,168; West Germany 532; East Germany 488.
Diatomite	775	747	Belgium-Luxembourg 200; France 118; United States 105.
Dolomite and magnesite	212	507	France 455.

See footnotes at end of table.

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Table 3.—Morocco: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal sources, 1966
Nonmetals—Continued			
Fertilizer materials:			
Crude, all types	4,327	193	France 100; Netherlands 70.
Manufactured:			
Nitrogenous	48,479	4,724	France 3,338; Italy 594; West Germany 575.
Phosphatic	1,336	------	
Potassic	11,989	15,294	Spain 5,080; Italy 4,095; East Germany 2,385; West Germany 1,702.
Mixed	13,637	8,074	West Germany 4,726; Italy 1,447; France 1,001.
Ammonia	------	63,724	West Germany 16,591; Portugal 15,290; France 6,957; Italy 6,487.
Graphite	18	19	Mainly from France.
Lime	315	624	All from France.
Salt	239	52	Mainly from France.
Stone, sand and gravel:			
Sand, industrial	4,768	9,301	Belgium-Luxembourg 8,450; West Germany 210.
Stone, crushed and broken	10	159	Italy 148.
Stone, dimension	570	358	West Germany 180; Italy 167.
Sulfur, crude and refined	10,984	13,878	France 10,564; West Germany 263; Canary Islands 150.
Sulfuric acid	15	12	West Germany 4; Bahrain 4; Belgium-Luxembourg 3.
Talc	1,237	1,618	France 1,311; Norway 238.
Minerals, n.e.s.	284	500	Italy 148; France 141; Sterling areas 95.
Chemicals inorganic:			
Potash, caustic	52	51	Mainly from France.
Soda, caustic	5,266	5,757	France 4,650; Netherlands 1,000.
Other	133	1,765	France 1,503; West Germany 142.
Mineral fuels:			
Coal, coke and briquets. thousand tons	44	33	Poland 15; West Germany 13.
Petroleum: Crude thousand 42-gallon barrels	7,846	7,826	U.S.S.R. 3,833; Algeria 2,354; Saudi Arabia 1,510.
Refinery products: [5]			
Gasoline ---do---	55	70	Netherland Antilles 56; Iran 8; Netherlands 3.
Kerosine ---do---	189	210	France 78; Netherland Antilles 68; Algeria 34.
Distillate fuel oil ---do---	51	4	Aden 1; Netherland Antilles 1.
Residual fuel oil ---do---	24	4	France 3.
Lubricants ---do---	109	136	France 88; Netherlands 35; Belgium-Luxembourg 4.
Liquefied petroleum gas. do---	42	53	France 45; Italy 8.
Asphalt and bitumen. do---	228	180	France 118; Spain 38; Canary Islands 6.
Parraffin, waxes and unspecified. do---	42	64	France 40; West Germany 11; East Germany 7.
Total ---do---	740	721	

• Estimate. NA Not available.

[1] Source: Statistiques Du Mouvement Commercial Et Maritime Du Maroc, 1965; Ministere Du Commerce et De L'Artisanat; Mohammedia (Fédala), Moroc.
[2] Source: Statistiques Du Commerce Exterieur Du Maroc, Annee 1966; Ministere Des Finances; Mohammedia (Fédala) Moroc.
[3] Includes scrap, ingots, and semimanufactures.
[4] Includes iron powder and grains.
[5] Excludes receipts of fuel oils at Ceuta and Melilla (Spanish enclaves), mainly for bunkers.

COMMODITY REVIEW

METALS

Antimony.—Production of concentrate increased 18 percent over that of 1966. Apparently marketing difficulties, encountered in past years that were reportedly the result of the low grade of the concentrate were being overcome; exports rose over 12 percent in 1967 to 3,620 tons.

Cobalt.—Concentrate production decreased 3 percent after rising for the previous 3 years. Output came from the

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new mine located at Aghbar near the exhausted Bou Azzer mine. In 1966 production from the new mine was supplemented by reworking slag from Bou Azzer. Exports of 18,827 tons of concentrate in 1967 were almost 4 percent lower than those of 1966.

Copper.—Although concentrate production decreased almost 6 percent, output continued at a relatively high level for Morocco in response to a second year of high world market prices. Moroccan production is economically marginal, but serious efforts were being made to develop and exploit known deposits. A group of companies, which included d'Occidental Ores (a subsidiary of Occidental Petroleum Corp.), the Moroccan Government agency, Bureau de Recherches et de Participations Minières (BRPM) and Omnium Nord Africain have been conducting core drilling operations south of Taraudant. Occidental reportedly has completed a geological reconnaissance over a 15,000-square-mile area in the Anti Atlas Mountains area.[7] Five areas were selected for more intensive geological investigation. In April agreement was reached with a Yugoslavian group to invest in copper exploration in Morocco.[8]

Iron and Steel.—Société des Mines du Rif (formerly Compagnie Espagnole des Mines du Rif), a Spanish firm that produced up to 1 million tons of iron ore from the Sétolazar and Uixam mines near Nador, was taken over by the Moroccan Government.[9] Iron ore from these mines would be used in a $150 million integrated steel mill planned for construction at Nador. A feasibility study of the proposed plant was being conducted for the Government of Morocco in 1967. The deposit at Sétolazar reportedly contains low-grade ore. The Uixam deposit has ore of 60 or 62 percent iron, but it also contains sulfur. A pelletizing plant estimated to cost about $20 million would be required for preparing the ore for use in the proposed steel mill. The Government is interested in keeping the mines operating because they employed 2,543 workers in an area that contains a high proportion of unemployed persons.

Lead and Zinc.—Production of lead concentrate in 1967 decreased almost 3 percent from output in 1966, and exports dropped 13 percent to 79,714 tons. This was the second year of sharp declines in concentrate export, reportedly caused by the lower price for lead minerals on the world market. Zinc concentrate production declined 12 percent while exports in 1967 decreased almost 6 percent to 75,461 tons. The nationalization in May 1966 of the Algerian part of the Zellidja mine on the border has not affected Moroccan lead and zinc production. However, most reserves in the deposit are on the Algerian side of the border. Failure to reach an agreement that would give Morocco access to these reserves threatens to close the mine and plant. Algeria was not exploiting the reserves in its territory, because it lacked facilities for beneficiating the ore. A modern flotation plant is located on the Moroccan side. Another problem confronting the Moroccan company is that its former route of export to the port of Ghazaouet (formerly Nemours), Algeria, has been cut off. Lead and zinc concentrate for export now must be trucked more than twice as far, to the port of Melilla. A U.S. company, Mineral Research of Morocco, was investigating deposits in the Bou Arfa area. Lead and zinc deposits at Bou Madine in the Ksar-Es-Souk area was scheduled for study by technicians from the U.S.S.R. A consortium of Société Miniere et Métallurgique de Peñarroya, Société des Mines de Zellidja and the Morroccan BRPM was studying the possibility of putting the Zeida mine in Upper Moulouya into operation.[10] The mine was estimated to have reserves of several million tons of low-grade lead and zinc oxide. A smelter also may be constructed by the group at Kenitra.

Manganese.—Output of metallurgical grade ore dropped almost 31 percent from that of 1966, chiefly as a result of the closing in early 1967 of the Bou Arfa mines. The Moroccan Government tried to keep the mines open, because they employed almost 1,000 persons from the impoverished area. However, low-grade ore and lack of reserves made subsidized operation of the mines unjustified. Produc-

[7] Mining Journal (London). Moroccan Copper Exploration. V. 268, No. 6862, Feb. 24, 1967, p. 138.
[8] Privredni Pregled (Belgrade). Yugoslavs To Explore for Copper in Morocco. Apr. 18, 1967, p. 6.
[9] World Mining. V. 3. No. 5, May 1967, p. 40.
[10] World Mining. V. 3, No. 3, March 1967, p. 39.

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tion of chemical grade manganese ore increased almost 14 percent compared with 1966 output. Export of chemical ore by mining organizations in 1967 totaled 70,831 tons as follows: Société Anonyme Cherifienne d'Etudes Minieres (SACEM), Imini mine 63,410 tons; Société Loubere 4,921 tons; Ufirmetz Maroc 2,500 tons. Metallurgical grade ore totaling 79,080 tons was exported in 1967 from the following mines: Imini 24,329 tons; Bou Arfa 13,637 tons; C.M.A. 18,764 tons; Tisgui-Lilane 847 tons; Tazdremt 5,234 tons; Migoudane 1,245 tons; Narguechoum 15,024 tons. In addition Imini shipped 74,978 tons of manganese sinter in 1967.

NONMETALS

Phosphate.—Production increased almost 12 percent to reach a peak surpassing its previous high of 1964. Output at Khouribga increased by 1,164,853 tons, whereas production of lower grade ore at Youssoufia decreased by 59,072 tons. The increased output from Khouribga was probably the result of open pit operations that started in June 1966 at the Meraa El Arech mine. This more than offset the closing of one of the three remaining underground mines in the area. The Safi Chemical Complex, which began to produce diammonium phosphate and triple superphosphate in early 1967, consumed 323,000 tons of low-grade ore from Youssoufia compared with 320,000 tons in 1966. Exports of manufactured phosphatic material increased sharply in 1966. The Safi complex has faced marketing problems in establishing outlets in Western Europe.

Work on Morocco's third major phosphate mine was started in March at Ben Guerir, north of Marrakesh.[11] The mine was being developed by a subsidiary of Occidental Petroleum Corp. and Morocco's Office Cherifienne Des Phosphates (OCP). Production at Ben Guerir was to begin in 1970. The deposit reportedly contains proven reserves of 30 million tons and probable total reserves of 1,000 million tons.

An article that described the underground and opencast mining methods used in Moroccan phosphate mines was published.[12] The processing plant and shipping facilities also were described. In 1967 about 15,000 workers were employed by the phosphate industry.

Potash.—Work continued on the deposit located at Khemisset, 80 kilometers east of Rabat. In late 1966 Morocco signed an agreement with Interexport of Belgrade, Yugoslavia, and Centrozap of Warsaw, Poland, for development and exploitation of the deposit.[13] Known reserves in the 29,800-hectare area were reported to be 200 million tons of carnallite in beds averaging 5.5 meters thick, at depths of 500 to 800 meters. Studies indicate that potash of 90.95 percent purity can be prepared from the ore by flotation and crystallization.

Pyrite and Pyrrhotite.—Production of pyrrhotite, which has been increasing for the last 3 years, rose 25 percent compared with output in 1966. Both pyrite and pyrrhotite are used at the Safi Chemical Complex to produce sulfuric acid. Iron-bearing residues have been stockpiled owing to marketing problems.

MINERAL FUELS

Coal.—Although Morocco's only coal mine, the Djerada property, has been operating on a Government subsidy for a number of years because of high production costs and marketing problems, production has increased considerably since 1964, chiefly to meet increased demand by electric power and cement producers. The export market has fluctuated in recent years, but the 1967 level of 79,000 tons was close to the 1965 level and considerably above that of 1966. Import data for 1967 are not available, but in 1966, receipts of coal, coke, and briquets declined by about 11,000 tons relative to the 1965 level.

A contract was signed in 1967 with the U.S.S.R. company, Energomachexport, to build a $34 milion, 110-megawatt thermal-electric powerplant, which will use coal from the Djerada mine.

Natural Gas.—The first industrial use of natural gas discovered at Essaouira was planned.[14] The deposit estimated at over 17.6 billion cubic feet will furnish

[11] Financial Times. Work Starts on Major Morocco Phosphate Mine. No. 24,483, Mar. 6, 1968, p. 7.
[12] Mining and Minerals Engineering. Phosphate Production in Morocco. V. 3, No. 1, January 1967, pp. 21–28.
[13] World Mining (Brussels). Underground Potash Deposit Will Be Mined at Khemisset. V. 2, No. 9, August 1966, p. 9.
[14] FDC Israel Newsletter. Morocco. No. 11, November 1966, p. 16.

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fuel for manufacturing phosphate fertilizers at Yanssoufia. Société Chérifienne Des Pétroles will build a $3.3 million gas treatment plant and a 180-kilometer pipeline. After the Essaouira reserves are exhausted in about 12 years, Morocco will import natural gas from Algeria. Petrofina, S. A., in partnership with Morocco's BRPM reportedly discovered natural gas in the Gharb basin near Kenitra.[15] The deposit was being tested, but by mid-1967 had not been proven commercially valuable.

Small quantities of gas were produced from SCP fields at Kachoula and Jaer. Estimated reserves were 15,892 to 17,658 million cubic feet.

Petroleum.—Production of crude oil from Morocco's two active fields, Rharb and Sidi-Rhalem, decreased almost 6 percent compared with that of 1966. Output from the Rharb field has been declining steadily, because reserves have been depleted. In 1966 recoverable reserves of both fields reportedly totaled 211,000 tons.[16] Of this quantity, the Rharb field had reserves of 57,000 tons representing 4.3 percent of the original reserves in place. The 154,000 tons of crude remaining in the Sidi-Rhalem field represented 28.5 percent of the original reserves. Petroleum exploration activity in 1966 was conducted by a joint venture company formed by West Germany's Preussische Bergwerks und Hütter A.G. with 80 percent, and Morocco's (BRPM) 20 percent, at the Doukkala permit near Qualidia, about 60 kilometers north of Safi.[17] Four wells have been drilled since 1964 with no success. A joint company formed by Italy's Ente Nazionale Idrocarburi (80 percent) and Morocco's BRPM (20 percent) drilled in the Hauts Plateaux permit near Berguent. The company was also responsible for operations in one offshore and one onshore permit in Tarfaya province in southern Morocco.

The Candel-Richfield oil group ceased exploration activities after sinking three dry wells in the Ksar-Es-Sauk area. In May 1967 the Moroccan Government announced that BRPM would relinquish its monopoly of all drilling operations.[18] Foreign companies will be allowed to bring in their own equipment to sink test wells. Esso Exploration, Inc., a subsidiary of Standard Oil Co. of New Jersey, was granted permission to explore for petroleum off the southern coast of Morocco.[19] Four permits were granted covering a total area of about 20,000 square kilometers from the southern border of Tarfaya Province north to Cape Dra and from the shore to a water depth of 200 meters on the continental shelf.

The SCP refinery at Sidi Kacem treated 295,824 tons of crude oil in 1966 and 368,725 tons in 1967; the increase was the result of operation of a new 46,500-ton-per-year catalytic reformer. Crude oil throughput at the Société Marocaine Italienne de Raffinage (SAMIR) refinery at Mohammedia totaled about 746,981 tons in 1966 and 944,303 tons in 1967. A new still plus asphalt and lube units, and increased storage capacity for crude and products, was added at the SAMIR refinery. The two refineries processed slightly over 20,000 barrels per day in 1966, and over 25,000 barrels per day in 1967.

An $18 million lube oil and bitumen refinery was planned for construction at Mohammedia.[20] The new refinery due to be completed by 1970 will be owned by Shell Oil Corp. (30 percent); SAMIR (25 percent); Société Chérifienne Des Pétroles (25 percent); and an Iranian group (20 percent). The integrated plant will be capable of producing 35,000 tons per year of lubricants and 50,000 tons per year of bitumen.

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[15] Arab Oil Review. V. 4, No. 1, January 1967, p. 12.
[16] Société Cherifienne Des Pétroles (Rabat). Annual Report for 1966. 1967, p. 15.
[17] World Petroleum Report 1967. Morocco. V. 13, 1967, p. 81.
[18] U.S. Embassy, Rabat, Morocco. State Department Airgram A-425, June 29, 1967, p. 6.
[19] U.S. Embassy, Rabat, Morocco. State Department Airgram A-313, Mar. 23, 1967, p. 1.
[20] Oil and Gas International. Morocco. V. 8, No. 2, February 1968, p. 112.

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The Mineral Industry of the Netherlands

By Columbus R. Gentile [1] and Edgar L. McGinnis [2]

In 1967 the mineral industry of the Netherlands rebounded from the 1966 economic slowdown. The natural gas and iron and steel industries led the way but partly offsetting their gains was the slowdown in activities of the coal industry in line with Government plans for shutdown of some operating units and cutback in levels of output at the remaining mines, now all supported by government subsidy payments.

The Netherlands economy as a whole registered an outstanding record in 1967 as the gross national product, according to preliminary estimates, rose to $22 billion, expanding by 4.5 percent, up sharply from the 2.5 percent rise in 1966. Industrial production showed a 5 percent growth rate in 1967, productivity climbing by 6 percent thereby offsetting a good part of rising costs and the upward pressure on prices and wages moderated. The Netherlands was not in a period of booming expansion, but the economic outlook, on the whole, was promising.

Crude oil output, which has shown virtually no change in recent years, declined in 1967, and prospects for discovery of significant added onshore petroleum reserves remained poor. In contrast, expansion of petroleum refining capacity, pipelines, and distribution facilities, continued at a rapid rate—a trend that is expected to prevail in the years ahead.

Rapid progress was made in expanding natural gas production and distribution facilities; output more than doubled, consumption and exports reached record levels and mainland reserves continued to rise. Meanwhile, exploration for oil and natural gas in the Netherlands sector of the North Sea was to be initiated almost immediately by several of the 18 companies granted concessions in March 1968.

Plans were announced for further steel industry expansion as operation of the largest blast furnace in the European Coal and Steel Community (ECSC) began at Ijmuiden. The new primary aluminum plant at Delfzijl, which became operative in mid–1966, completed its first full year of operation in 1967 and work was started on facilities that will more than double capacity by 1969. The first molybdenum conversion plant built in the Netherlands began operations in 1966 and produced at capacity (5,500 tons yearly) in 1967.

Significant changes are underway or planned in the Rotterdam port area; notably development of the section known as Europoort. Major projects include the development of a huge industrial petroleum refinery and petrochemical complex, construction of storage units, extension of the pipeline system for the movement of crude and oil products, and expansion of port facilities to accommodate the larger vessels and tankers now being built. One of the more notable industrial projects, a joint venture of 20 large European steel companies, is the construction of iron ore processing facilities having a yearly capacity of 15 million tons and of a pelletizing plant with a production capacity of 5 million tons annually. Associated projects for the port area provide for the improvement of other port handling facilities, as well as connecting canals and waterways.

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PRODUCTION

Natural gas output to the detriment of coal and domestic crude oil more than doubled for the third consecutive year as distribution networks increased availability of this fuel. In the face of this competition, output of coal, coke, and briquets fell by 20, 14, and 12 percent, respectively, and crude oil production decreased some 4.3 percent. Refinery output of distillate and residual fuel oils and liquefied petroleum gases, however, continued to trend upward while output of most other refinery products was off slightly or showed little or no gain.

Responding to the improved economic climate, crude steel production rose 4.5 percent, primary tin output was up by 9.5 percent, and pig lead output advanced 10.3 percent, but in contrast, primary zinc production declined 6.4 percent. Production of aluminum was up 60 percent as the new plant, which became operative in mid–1966, completed its first full year of operation.

The generally improved economic conditions were also reflected in output of nonmetals: Salt and cement were up 3.7 percent and 5.9 percent, respectively, while nitrogenous and phosphatic fertilizers showed gains of 16 percent and 3 percent, respectively.

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Table 1.—Netherlands: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Aluminum [1] thousand tons	6	1	-------	20	e 32
Cadmium metal e	r 100	r 105	r 90	r 100	100
Iron and steel:					
Sinter thousand tons	2,355	2,787	r 3,212	r 3,025	e 3,271
Pig iron and ferroalloys do	1,709	1,948	2,364	2,209	2,579
Ingots and other primary forms [2] thousand tons	2,333	2,646	3,138	r 3,256	e 3,404
Castings:					
Iron do	216	238	247	r 251	e 221
Steel do	9	8	8	9	e 10
Rolled steel do	1,759	1,908	2,101	r 2,257	e 2,382
Semimanufactured steel do	289	292	284	343	e 379
Lead:					
Pig lead	11,864	17,315	15,372	14,656	16,168
Semimanufactures [1] thousand tons	16	18	17	18	17
Tin long tons	5,762	15,858	18,114	12,552	13,739
Zinc (primary)	35,762	37,702	40,821	41,357	38,704
Nonmetals:					
Cement thousand tons	2,081	2,873	2,973	3,163	3,349
Fertilizers:					
Nitrogenous, N content do	r 434	r 480	r 506	618	e 715
Phosphate, P_2O_5 content do	r 171	r 191	r 200	188	e 194
Potassic, K_2O content	2,600	2,500	2,500	e 2,500	NA
Salt thousand tons	1,479	1,596	1,707	1,857	1,926
Sulfur do	35	29	27	r 46	NA
Mineral fuels:					
Coal:					
Anthracite and bituminous thousand tons	11,509	11,480	11,446	10,052	8,065
Coal briquets do	1,561	1,355	1,349	1,222	1,090
Coke and semicoke, including gas coke [3] thousand tons	4,447	4,623	4,383	3,887	3,332
Lignite briquets do	63	66	46	43	28
Tar do	140	151	138	131	NA
Benzol do	r 45	48	47	41	NA
Gas, manufactured million cubic feet	r 137,329	r 143,358	r 135,698	108,775	93,153
Gas, natural [4] do	18,964	27,015	57,244	117,878	253,731
Peat e thousand tons	r 400	r 400	r 400	r 400	400
Petroleum:					
Crude thousand tons	2,215	2,270	2,395	2,366	2,265
Refinery products:					
Aviation jet fuels do	857	976	777	1,289	1,027
Motor gasoline do	3,827	2,769	2,746	2,250	2,189
Kerosine do	970	955	1,127	1,075	928
Solvents do	167	178	207	251	233
Residual fuel oil do	10,155	10,943	12,888	13,413	14,276
Distillate fuel oil do	5,164	6,025	6,567	7,837	8,075
Lubricants do	245	251	332	338	321
Bitumen do	584	681	678	745	673
Liquefied petroleum gas do	334	362	396	465	519
Refinery gas do	204	166	166	118	NA
Carbon black do	NA	52	62	70	75

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Including alloys.

[2] Except castings.

[3] Including breeze.

[4] Deliveries for sale. Converted from Nm^3 (cubic meters at 15° C and 760 mm mercury) at rate of 35.314 cubic feet per cubic meter.

TRADE

Foreign trade of the Netherlands again moved in the direction of better equilibrium. Based on preliminary data for 1967, exports covered 87 percent of imports, falling short by approximately $1 billion. During the year total exports of roughly $7.3 billion were up 7.9 percent, while imports rose 3.9 percent. The year 1967 featured a slowdown in exports to West Germany and a sharp increase in shipments to Japan, Eastern Europe, and Indonesia. There was a rise in the share of imports supplied by European Economic Community (EEC) nations, with France registering the greatest percentage increase.

For mineral commodities, imports exceeded exports by $728 million in 1967, as

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imports increased 10.4 percent and exports only 6.6 percent. As a result, mineral imports accounted for even a greater share of total trade in 1967 than in the previous year, while mineral exports represented a slightly smaller proportion of total exports as shown in the following table.:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	1,155	6,393	18.1
1966	1,133	6,752	16.8
1967 p	1,208	7,281	16.6
Imports:			
1965	1,698	7,462	22.8
1966	1,753	8,018	21.9
1967 p	1,936	8,323	23.3
Trade balance:			
1965	−543	−1,069	XX
1966	−620	−1,266	XX
1967 p	−728	−1,042	XX

p Preliminary XX Not applicable.
[1] Includes value of all commodities listed in tables 2 and 3 of this chapter except for gold and such diamonds and other precious stones as were classified in sources as being of gem quality.

The most important mineral commodities exported from the Netherlands in 1966, on the basis of value share of total commodity exports, were petrolum and its products (33.1 percent), iron and steel (23.1 percent), nonferrous metals (11.5 percent), coal, coke, and briquets (8.6 percent), and manufactured fertilizer (4.6 percent). Exports of petroleum and products declined in value by 12 percent to $375 million; coal, coke, and briquets by 15 percent to $98 million; and manufactured fertilizer by 30 percent to $52 million. The most significant rise in exports of major products was registered by iron and steel which increased almost 8 percent to $262 million. Nonferrous metal exports, at $130 million, were up slightly from the previous year ($129 million).

About 84 percent of Netherlands' mineral commodities exports in 1966 moved to Western European countries, principally (52.9 percent) EEC countries. Major destinations included West Germany (25.7 percent); Belgium-Luxembourg (15.1 percent); United Kingdom (12.3 percent); and France (8.9 percent).

Among 1966 imports, petroleum and refinery products (36.5 percent), iron and steel (23.1 percent), nonferrous metals (12.5 percent), metal ores and scrap (7.1 percent), and coal, coke, and briquets (7 percent) remained the most important categories by value. Imports of petroleum and products in 1966 increased 3 percent to $639 million; iron and steel almost 8 percent to $405 million; and nonferrous metals (including silver and platium metals) 12 percent to $219 million. In contrast, imports of metal ores and scrap at $125 million were down by some 8 percent, and coal, coke, and briquets at $123 million declined almost 10 percent.

West Europe, principally EEC countries (47.5 percent), supplied more than 55 percent of mineral commodities to the Netherlands in 1966. The more significant sources of imports (based on value) were West Germany (23.8 percent), Belgium-Luxembourg (17.4 percent), Kuwait (6 percent), Saudi Arabia (5.2 percent), United States (5.1 percent), Libya, France, and Indonesia with 4.9, 4.3, and 3.6 percent, respectively.

The entrepôt trade in crude oil and refined petroleum products continued at a high level in 1966, with entries in bond of 25.4 million tons and withdrawals of 23.3 million tons. Entries of crude amounted to 14.2 million tons and withdrawals almost 14 million tons. Comparable totals for petroleum products were 11.2 million tons and 9.3 million tons, respectively. The net increase of crude in bond was 232,000 tons, and of products 1,827,000 tons.

As in the previous year, transit trade in mineral commodities in 1966 remained at a high level with the bulk of the tonnage comprised of metal ores, coal-coke-briquets, fertilizers and fertilizer materials, petroleum and products, and sand-gravel-crushed stone.

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Table 2.—Netherlands: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Bauxite and alumina	40	43	Belgium-Luxembourg 13.
Scrap	9,468	11,735	West Germany 9,285; Italy 1, 185.
Ingot [1]	1,019	16,156	West Germany 9,825; Belgium-Luxembourg, 4,535.
Semimanufactures	15,853	17,463	West Germany 6,205; Belgium-Luxembourg 3,358.
Bismuth, all forms	280	229	West Germany 91; France 67.
Cadmium, all forms	307	266	West Germany 149; Belgium-Luxembourg 63.
Chromite	1,002	1,713	Italy 538; United Kingdom 466.
Chrome oxides and hydroxide	66	72	West Germany 58.
Cobalt:			
Metal, all forms	88	71	United States 45; France 22.
Copper:			
Scrap	32,424	34,793	West Germany 16,318; Belgium-Luxembourg 14,876.
Unwrought [1]	5,742	9,088	West Germany 3,738; Belgium-Luxembourg 1,629; Italy 1,542.
Semimanufactures	16,173	16,059	West Germany 6,426; United States 3,550.
Gold [2] thousand troy ounces	102	208	Switzerland 61; Belgium-Luxembourg 38; France 32.
Iron and steel:			
Iron ore thousand tons	7	4	West Germany 3.
Pyrite cinder do	258	190	West Germany 185.
Blast furnace slag and waste do	91	130	West Germany 67; Belgium-Luxembourg 62.
Scrap do	451	394	West Germany 258; Belgium-Luxembourg 82.
Pig iron and ferroalloys [3] do	85	100	Belgium-Luxembourg 27; West Germany 18; France 17.
Ingots and other primary forms. do	609	736	Belgium-Luxembourg 250; Spain 220; West Germany 115.
Semimanufactures:			
Bars, rods, angles, shapes, sections. do	197	286	West Germany 160; Belgium-Luxembourg 36; Sweden 25.
Universals, plate and sheet. do	870	849	West Germany 198; United Kingdom 131; Sweden 85; France 81.
Hoop and strip do	65	56	West Germany 42.
Railway track material do	9	28	United States 21.
Wire do	26	25	West Germany 10; United States 3.
Tubes, pipes and fittings do	134	162	West Germany 49; Belgium-Luxembourg 23; United Kingdom 13.
Castings and forgings do	3	4	Belgium-Luxembourg 2; West Germany 1; Sweden 1.
Oxide and hydroxide	317	258	Ceylon 47; West Europe 88.
Lead:			
Scrap	7,604	4,673	Belgium-Luxembourg 4,399.
Ashes and residues	4,531	2,859	Belgium-Luxembourg 2,046; West Germany 689.
Pig [1]	8,040	11,611	West Germany 8,852; United States 1,231.
Antimonial and other alloys	1,798		
Semimanufactures	1,550	2,039	Norway 514; United States 487.
Oxides	709	1,503	Belgium-Luxembourg 694; Czechoslovakia 580.
Magnesium, all forms	291	252	United States 85; United Kingdom 75.
Manganese:			
Ore	8,727	10,766	Italy 2,051; West Germany 1,997; France 820; Belgium-Luxembourg 795.
Oxide	917	1,667	Belgium-Luxembourg 580; West Germany 220.
Mercury 76-pound flasks	609	638	West Germany 319.
Molybdenum metal	126	155	West Germany 98; United States 19.
Nickel:			
Scrap	1,186	1,290	West Germany 708; United Kingdom 210.
Ingots anodes and semimanufactures. [1]	295	765	West Germany 816; Italy 176.
Oxide and hydroxide	7	10	Brazil 4; Belgium-Luxembourg 3.
Platinum and platinum group metals, all forms. troy ounces	39,738	27,200	France 4,662; West Germany 4,533; Italy 2,379.

See footnotes at end of table.

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Table 2.—Netherlands: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Silver:			
Scrap and waste [4] thousand troy ounces	1,984	2,048	West Germany 966; France 583; Belgium-Luxembourg 478.
Unwrought [1] do	1,235	845	France 697; West Germany 69; United Kingdom 21.
Semimanufactures do	359	273	Denmark 182; Belgium-Luxembourg 44.
Tantalum	2	5	France 1; United Kingdom 1; Italy 1; West Germany 1.
Tellurium and arsenic	2	------	
Tin:			
Ashes and residues long tons	1,331	NA	
Ingots [1] do	15,965	11,891	West Germany 6,431; France 2,352.
Scrap and semimanufactures do	666	697	United Kingdom 154; West Germany 152.
Oxide do	1	5	All to France.
Titanium:			
Dioxide	8,628	10,726	West Germany 2,233; Italy 1,727; France 1,678; Belgium-Luxembourg 1,210.
Tungsten:			
Ore	87	92	West Germany 25; Belgium-Luxembourg 15.
Metal	229	221	United Kingdom 73; West Germany 54.
Vanadium, molybdenum, etc. ores	576	5,863	West Germany 1,460; Austria 1,101; United Kingdom 943.
Zinc:			
Ore	5,821	4,443	Belgium-Luxembourg 3,821; West Germany 622.
Ashes and residues	9,954	9,371	Belgium-Luxembourg 4,833; West Germany 3,246.
Scrap	10,129	10,325	France 9,911.
Slab [1]	22,693	23,235	West Germany 14,191; Denmark 1,873.
Semimanufactures (include zinc dust).	1,386	1,103	Denmark 518; West Germany 233.
Oxide	9,510	9,621	West Germany 1,624; Italy 1,215; Belgium-Luxembourg 976.
Other nonferrous ores	------	32	West Germany 5.
Other nonferrous metals [1]	779	661	West Germany 256; Belgium-Luxembourg 127.
Other nonferrous ashes and residues	9,516	12,525	West Germany 8,872; Belgium-Luxembourg 2,484.
Metalloids:			
Selenium	1	4	Canada 3.
Silicon [4]	1	10	All to West Germany.
Other	672	19	West Germany 12.
Alkali, alkaline-earth, and rare-earth metals.	5	------	
Oxides of strontium, barium and magnesium.	99	203	Belgium-Luxembourg 170.
Other slags and ashes	26,820	21,201	Belgium-Luxembourg 14,879; West Germany 5,144.
Nonmetals:			
Abrasives, natural	4,747	4,879	France 508.
Grinding stones	567	727	West Germany 266; United Kingdom 115; France 91.
Asbestos	93	15	NA.
Borates, natural	133,546	170,289	West Germany 61,959; France 31,144; United Kingdom 29,489.
Cement	12,705	35,942	West Germany 30,779; Belgium-Luxembourg 4,568.
Chalk	12,801	16,867	Belgium-Luxembourg 16,334.
Clays:			
Kaolin	116	752	Belgium-Luxembourg 594.
Refractory	1,487	1,761	Sweden 731; Belgium-Luxembourg 355.
Other thousand tons	136	119	West Germany 84; Belgium-Luxembourg 29.
Construction materials:			
Refractory building products	6,754	7,843	West Germany 3,738; Belgium-Luxembourg 1,226.
Brick, etc. nonrefractory. thousand tons	511	528	West Germany 432.
Diamond and other gem stones:			
Diamond, unworked and worked. thousand carats	966	1,310	NA.
Diamond powder do	880	1,079	West Germany 358; France 175; Italy 167; United States 90.
Other gem stones, unworked and worked. kilograms	10,679	20,142	West Germany 19,885.
Diatomaceous earth	144	133	All West Europe.

See footnotes at end of table.

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Table 2.—Netherlands: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals—Continued			
Feldspar, leucite and fluorspar	2,095	558	Belgium-Luxembourg 444.
Fertilizers:			
Nitrogenous:			
Manufactued—thousand tons	584	442	China, mainland 76; United Kingdom 50; Sweden 49; Pakistan 42.
Phosphatic:			
Phosphate rock	976	557	Liberia 391.
Basic slag	7,794	5,248	West Germany 5,237.
Superphosphate and other—thousand tons	378	290	France 125; West Germany 14.
Potassic	1,568	1,577	Mozambique 522; Morocco 248; Thailand 200.
Other—thousand tons	466	424	NA.
Ammonia, anhydrous	5,093	38,886	West Germany 26,317; Belgium-Luxembourg 9,602.
Lime	976	1,384	Belgium-Luxembourg 963.
Magnesite	32,735	28,940	West Germany 9,748; Belgium-Luxembourg 1,506.
Mica	104	76	NA.
Potash, caustic	50	45	NA.
Quartz and quartzite	6,194	4,137	Belgium-Luxembourg 2,277; West Germany 1,629.
Salt—thousand tons	979	1,057	Belgium-Luxembourg 353; Sweden 311; Finland 151.
Sand—do	6,438	6,909	Belgium-Luxembourg 6,369.
Stone, building, unworked (including slate).	8,085	3,457	Belgium-Luxembourg 2,328; West Germany 905.
Stone, building, worked (including slate and natural paving stones).	11,264	4,086	Belgium-Luxembourg 3,279; West Germany 692.
Stone, other, calcareous (including gypsum and plasters).	545	297	All to Belgium-Luxembourg.
Stone, crushed and gravel—thousand tons	2,027	2,161	Belgium-Luxembourg 1,935; West Germany 224.
Sulfur	3,052	50	All to Belgium-Luxembourg.
Sulfuric acid, oleum—thousand tons	93	100	West Germany 25; Belgium-Luxembourg 17
Sulfur dioxide	437	917	NA.
Talc and steatite	350	210	NA.
Other mineral substances—thousand tons	164	167	Belgium-Luxembourg 97; West Germany 51; France 14.
Mineral fuels:			
Natural bitumen, asphalt, etc	52	82	West Germany 75; Belgium-Luxembourg 7.
Carbon black	52,600	60,241	France 13,045; West Germany 10,228; Sweden 9,501; Belgium-Luxembourg 5,717.
Coal and coke:			
Anthracite and bituminous—thousand tons	2,092	1,850	Belgium-Luxembourg 950; France 618.
Coal briquets—do	835	825	Belgium-Luxembourg 302; West Germany 292; France 202.
Lignite briquets—do	24	21	West Germany 9; France 8.
Peat—do	33	22	West Germany 9; France 6; Belgium-Luxembourg 6.
Coke and semicoke—do	2,404	1,903	France 764; Belgium-Luxembourg 543; West Germany 285.
Gas:			
Hydrocarbon:			
Manufactured—million cubic feet	18	NA	
Natural (including LPG)—thousand tons	246	310	Belgium-Luxembourg 129; United Kingdom 98; France 34; West Germany 21.
Hydrogen and rare gases	513	498	Belgium-Luxembourg 170; Denmark 127.
Petroleum: [3]			
Crude—thousand tons	11	1	All to Belgium-Luxembourg.
Refinery products:			
Gasoline—do	3,127	3,733	United Kingdom 1,674; West Germany 806; Sweden 218.
Kerosine, including jet fuel—do	719	812	United Kingdom 293; Sweden 132.
Distillate fuel oils—do	3,451	4,184	West Germany 1,520; Sweden 887; Bunkers 511.
Residual fuel oils—do	6,413	6,976	Bunkers 2,969; United Kingdom 1,315; Belgium-Luxembourg 788.
Lubricants—do	333	323	West Germany 45; United Kingdom 30; Sweden 22.
Paraffin, jelly, etc—do	22	20	West Germany 7.
Petroleum coke—do	58	52	United Kingdom 31; Italy 10.
Bitumen, bituminous mixtures and other derivatives—do	365	390	West Germany 293; Denmark 25.

See footnotes at end of table.

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Table 2.—Netherlands: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Mineral fuels—Continued			
Miscellaneous derivatives of coal, gas, and petroleum distillation.	122	141	Belgium-Luxembourg 42; West Germany 36; United States 12.

NA Not Available.
[1] Including alloys.
[2] Excluding gold coin and gold and alloys shipped by post.
[3] Including sponge iron, shot, grit, pellets, powder, spiegeleisen, and ferromanganese.
[4] Less than 99.99 percent pure.
[5] Includes bunkers for foreign ships and aircraft: excludes reexports from bonded storage.

Table 3.—Netherlands: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	21,690	35,305	Greece 32,913; British Guiana 1,995.
Alumina	10,594	71,875	Surinam 53,973.
Scrap	3,136	3,884	Belgium-Luxembourg 1,355; Ireland 499; France 462.
Ingots	11,675	19,829	Germany, 4,304; Canada 3,315; France 3,150.
Alloys	8,499		
Semimanufactures [1]	29,370	34,765	Belgium-Luxembourg 15,143; Germany 9,649; France 4,856.
Antimony, all forms	234	276	China mainland 96; Czechoslovakia 77; West Germany 39.
Arsenic, oxides and acids	901	836	Belgium-Luxembourg 783.
Bismuth, all forms	150	245	United Kingdom 50; West Germany 43; China, mainland 33; South Korea 35.
Cadmium, all forms	251	261	Belgium-Luxembourg 63; U.S.S.R. 48; Japan 46; Bulgaria 40.
Chromium:			
Ore	4,563	3,749	South Africa 1,563; Philippines 1,534.
Unwrought and semimanufactures	29	6	West Germany 3; United Kingdom 3.
Oxide and hydroxide	581	657	West Germany 343; China, mainland 121; France 119.
Cobalt, unwrought and semimanufactures.	248	163	Belgium-Luxembourg 83; France 38.
Cobalt, oxides and hydroxides	205	280	Belgium-Luxembourg 168; United Kingdom 112.
Copper:			
Scrap	10,440	8,712	West Germany 4,646; Belgium-Luxembourg 2,701.
Unwrought [1]	35,297	31,643	Zambia 11,816; United States 5,281; Belgium-Luxembourg 4,690.
Semimanufactures [1]	68,601	60,997	Belgium-Luxembourg 30,295; West Germany 13,819.
Gold [2]—thousand troy ounces	243	NA	
Iron and steel:			
Ore—thousand tons	3,570	3,451	Liberia 1,037; Sierra Leone 912; Mauritania 415; Sweden 304.
Pyrite cinder	6,237	NA	
Scrap—thousand tons	99	145	Belgium-Luxembourg 103; West Germany 33; United Kingdom 4.
Pig iron and blast furnace ferroalloys [3]	68	98	West Germany 53; Norway 10.
Other ferroalloys—thousand tons	11	12	Norway 4; West Germany 4.
Ingots and other primary forms—do	139	219	West Germany 85; Belgium-Luxembourg 56; Norway 49.
Semimanufactures:			
Bars, rods, sections—do	1,143	1,186	Belgium-Luxembourg 563; West Germany 397.
Universals, plates and sheets—do	496	541	West Germany 260; Belgium-Luxembourg 181.
Hoop and strip—do	196	196	West Germany 107; Belgium-Luxembourg 81.
Railway track material—do	53	46	West Germany 28; Belgium-Luxembourg 12.
Wire—do	59	58	Belgium-Luxembourg 32; West Germany 22.

See footnotes at end of table.

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Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Iron and Steel—Continued			
Semimanufactures—Continued			
Tubes, pipes and fittings_do	398	462	West Germany 239; France 74.
Castings and forgings_do	10	7	United Kingdom 2; Belgium-Luxembourg 2; West Germany 2.
Oxide and hydroxide	9,782	8,842	West Germany 6,680; France 791; Spain 703.
Lead:			
Ore	290	5	NA.
Scrap	3,457	2,977	West Germany 2,585.
Ashes and residues	717	1,194	West Germany 1,024.
Pig [1]	45,607	51,798	Belgium-Luxembourg 16,240; Mexico 9,242; Bulgaria 5,102.
Antimonial and other alloys	10,099		
Semimanufactures [1]	3,111	3,040	Belgium-Luxembourg 2,644; United Kingdom 128.
Oxides	8,155	8,048	Belgium-Luxembourg 4,075; France 1,820; West Germany 1,687.
Magnesium:			
Scrap	64	90	Norway 49.
Unwrought	187	208	Norway 193.
Semimanufactures	76	45	West Germany 14; Austria 13.
Manganese:			
Ore	16,570	27,261	U.S.S.R. 8,282; Republic of South Africa 7,263; China, mainland 5,141.
Oxides	604	635	Belgium-Luxembourg 205; France 160.
Mercury_76-pound flasks	5,773	3,539	Spain 2,553; United States 348.
Molybdenum (metal)	36	92	U.S.S.R. 74.
Nickel:			
Matte, speiss, etc	120	1,616	United Kingdom 641; Norway 446; Canada 158.
Scrap	745	1,059	West Germany 342; France 148.
Ingots and anodes [1]	994	2,040	United Kingdom 723; Norway 630.
Semimanufactures [1]	1,908	1,922	West Germany 1,204; United Kingdom 356.
Platinum and platinum-group metals. thousand troy ounces	74	58	France 14; West Germany 12; U.S.S.R. 11; United Kingdom 10.
Silver:			
Scrap and waste [4]_do	145	126	Denmark 92; United States 17.
Unwrought [1]_do	4,646	4,317	United States 1,622; United Kingdom 1,343; Mexico 500.
Semimanufactures_do	3,149	2,483	France 968; West Germany 798; United Kingdom 479.
Tantalum	4	8	United States 5.
Tellurium and arsenic	3	6	Belgium-Luxembourg 5.
Tin:			
Ore_long tons	24,021	15,880	Indonesia 13,471; Belgium-Luxembourg 1,017.
Ashes and residues_do	671	596	West Germany 239; Rhodesia 107; United States 92.
Ingots [1]_do	1,188	3,667	Nigeria 630; China, mainland 547.
Scrap and semimanufactures_do	394	344	Belgium-Luxembourg 128; West Germany 87.
Oxide_do	70	74	West Germany 36; Belgium-Luxembourg 31.
Titanium dioxide	3,961	1,794	West Germany 787; Italy 505; Belgium-Luxembourg 334.
Tungsten:			
Ore	244	438	Portugal 253; United Kingdom 122.
Metal	23	10	United States 5; West Germany 2.
Vanadium, molybdenum, etc., ores	7,618	19,464	Australia 8,710; United States 7,419.
Zinc:			
Ore	85,147	85,730	Finland 26,535; Canada 19,594; West Germany 9,732.
Ashes and residues	25,261	25,906	West Germany 18,877; United Kingdom 1,325; Denmark 1,146.
Scrap	1,282	2,029	West Germany 1,905.
Slab [1]	17,583	16,121	North Korea 3,048; Belgium-Luxembourg 2,778; Poland 3,015.
Semimanufactures (including dust)	6,876	6,222	Belgium-Luxembourg 2,993; West Germany 2,253; United Kingdom 619.
Oxides	2,094	1,514	West Germany 746; Belgium-Luxembourg 444.
Other nonferrous ores	5,522	8,071	Republic of South Africa 4,497.
Other nonferrous metals and scrap [1]	173	NA	
Metalloids:			
Selenium	5	22	United Kingdom 13; Canada 5.
Silicon [5]	99	163	Switzerland 99; Norway 20; Sweden 15.
Alkali, alkaline-earth and rare-metals	111	206	West Germany 203.
Oxides of strontium, barium, and magnesium.	514	604	United States 260; West Germany 133; United Kingdom 129.

See footnotes at end of table.

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Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Blast furnace dust, slag and waste. thousand tons	1,552	1,518	West Germany 808; Belgium-Luxembourg 706.
Other slags and ashes do	298	354	West Germany 235; Belgium-Luxembourg 119.
Nonmetals:			
Abrasives, natural thousand tons	434	392	West Germany 373; Italy 11.
Grinding stones	1,669	1,707	West Germany 791; Austria 249.
Asbestos	18,931	17,028	Canada 10,447; U.S.S.R. 2,445; Italy 1,372.
Barite	29,162	28,300	West Germany 24,111; Morocco 3,050.
Borates, natural	164,972	173,644	United States 170,893.
Boric oxide, boric acid	2,464	1,669	France 663; Italy 364.
Cement thousand tons	2,018	2,091	Belgium-Luxembourg 1,119; West Germany 920.
Chalk	72,610	92,437	Belgium-Luxembourg 51,841; France 29,254; West Germany 10,614.
Clays:			
Kaolin thousand tons	128		
Refractory do	83	680	West Germany 482; United Kingdom 142.
Other do	466		
Construction materials:			
Refractory do	52	42	United Kingdom 15; West Germany 14.
Brick, etc., nonrefractory do	202	184	Belgium-Luxembourg 98; West Germany 67.
Cryolite and chiolite, natural	143	1,558	All from Denmark.
Diamond and other gem stones:			
Diamond, unworked and worked. thousand carats	1,184	1,544	NA.
Diamond powder do	950	1,177	Ireland 946; United Kingdom 132.
Other gem stones, unworked and worked. [6] thousand kilograms	148	216	Brazil 190; West German 22.
Diatomaceous earth	8,532	8,179	Hungary 3,469; United States 1,848.
Dolomite thousand tons	422	382	Belgium-Luxembourg 329.
Feldspar and leucite	26,966	26,049	Norway 10,704; Canada 5,162; Sweden 1,958.
Fertilizer materials:			
Natural:			
Phosphate rock. thousand tons	783	706	Morocco 431; Togo 224.
Potassium salts do	88	61	France 32; West Germany 30.
Sodium nitrate do	30	29	All from Chile.
Manufactured:			
Nitrogenous	7	12	West Germany 8; Belgium-Luxembourg 3.
Phosphatic:			
Basic slag thousand tons	254	197	Belgium-Luxembourg 172.
Other	61	19	Belgium-Luxembourg 6; United States 4.
Potassic thousand tons	411	393	West Germany 156; Belgium-Luxembourg 85.
Other	60	52	Belgium-Luxembourg 43.
Ammonia, anhydrous	27,512	3,858	Belgium-Luxembourg 3,441; West Germany 404.
Fluorspar	18,972	15,808	China, mainland 9,968; Spain 1,832; United Kingdom 1,642.
Graphite, natural	342	246	West Germany 123.
Gypsum thousand tons	204	299	West Germany 237; France 45.
Lime do	645	636	West Germany 316; Belgium-Luxembourg 301.
Limestone do	811	707	Belgium-Luxembourg 702.
Magnesite	43,620	36,907	Greece 23,841; India 4,072; Yugoslavia 2,996.
Mica:			
Unworked, including waste and scrap.	957	821	United Kingdom 504; Norway 197.
Worked	60	57	United Kingdom 25; Switzerland 18.
Pigments, natural	1,028	1,172	West Germany 412; Austria 360; France 254.
Potash, caustic	6,642	6,872	Belgium-Luxembourg 2,905; France 2,819.
Pyrite thousand tons	211	270	Cyprus 167; Spain 60.
Quartz and quartzite	45,815	48,271	Belgium-Luxembourg 25,137; Norway 10,917; West Germany 10,156.
Salt	35,593	47,574	West Germany 38,899; Italy 8,602.
Sand, Industrial and other. thousand tons	2,741	4,176	West Germany 4,140.
Slate	31,306	28,390	West Germany 13,949; France 7,442.
Soda, caustic	73,254	89,780	West Germany 61,990; United States 16,164.
Stone, dimension thousand tons	1,529	1,382	Belgium-Luxembourg 1,064; West Germany 270.
Stone, crushed and gravel do	8,753	8,746	West Germany 6,078; Belgium-Luxembourg 2,198.

See footnotes at end of table.

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Table 3.—Netherlands: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Sulfur, elemental thousand tons	218	201	United States 147; France 51.
Sulfuric acid, oleum	75,243	71,304	Belgium-Luxembourg 38,416; West Germany 32,882.
Sulfur dioxide	------	408	All from West Germany.
Mineral fuels:			
Asphalt and bitumen, natural	1,518	968	Trinidad 546; United States 249.
Carbon black (including other black of carbon).	8,918	7,521	West Germany 3,490; France 1,852; United Kingdom 1,083; United States 793.
Coal and coke:			
Anthractie and bituminous. thousand tons	7,107	6,697	West Germany 3,423; United States 1,911; Belgium-Luxembourg 618; United Kingdom 349.
Coal briquets do	55	45	West Germany 40.
Lignite do	149	248	West Germany 247.
Lignite briquets do	146		
Peat do	73	95	West Germany 94.
Coke and semicoke do	281	209	West Germany 160; United Kingdom 30.
Gas:			
Hydrocarbon:			
Manufactured. million cubic feet	110	NA	
Natural (including LPG). thousand tons	106	121	West Germany 107; Belgium-Luxembourg 12.
Hydrogen and rare gases	56	100	Belgium-Luxembourg 40; West Germany 28; Hungary 26.
Petroleum: [7]			
Crude thousand tons	26,379	29,643	Kuwait 6,418; Saudi Arabia 5,874; Libya 5,267; Syria 3,645.
Refinery products:			
Gasoline do	409	463	Belgium-Luxembourg 212; Netherlands Antilles 69; Bahrain 50.
Kerosine, including jet fuel. do	367	322	Belgium-Luxembourg 197; Portugal 45.
Distillate fuel oils do	1,301	1,805	Italy 336; Belgium-Luxenbourg 252; United Kingdom 193; Indonesia 176.
Residual fuel oils do	4,082	3,917	Indonesia 1,434; West Germany 1,060; United Kingdom 440.
Lubricants do	337	354	Netherlands Antilles 207; Italy 33.
Paraffin, jelly, etc do	19	20	West Germany 7; Indonesia 3.
Petroleum coke	54	99	West Germany 47; United States 26.
Bitumen, bituminous mixtures and other derivatives. do	210	231	Belgium-Luxembourg 118; United States 77.
Miscellaneous derivatives of Coal, gas, and petroleum distillation. do	153	211	United States 70; West Germany 36; Belgium-Luxembourg 34.

NA Not available.
[1] Including alloys.
[2] Excluding gold coin and gold and alloys shipped by post.
[3] Including sponge iron, shot, grit, pellets and powder; spiegeleisen and ferromanganese.
[4] Including other precious metals.
[5] At least 99.99 percent pure.
[6] Including articles of piezo-electric quartz.
[7] Includes bunkers for Netherlands ships and aircraft; excludes deliveries to bonded storage.

COMMODITY REVIEW

METALS

Aluminum.—In 1967, the Netherlands' only aluminum smelting works, the plant of Aluminium Delfzijl N.V. (Aldel) at Delfzijl near Rotterdam, operated at capacity, producing 32,000 tons of ingots, slab, and rods. The plant, opened in 1966, is owned by Koninklijke Nederlandsche Hoogovens en Staalfabrieken N.V. (Hoogovens) 50 percent; Swiss Aluminium Ltd. (Alusuisse) 33 1/3 percent; and N.V. Billiton Maatschappij (Billiton) 16 2/3 percent. Work was in progress to expand capacity to 90,000 tons by 1969, and plans provide for an increase to 130,000 tons within 5 years and to 150,000 to 200,000 tons soon after. Natural gas from fields near Groningen is used to generate electric power for the smelter. Anodes are supplied by N.V. Aluminium en Chemie (Aluchemie), a subsidiary of Alusuisse, from a new plant in the Botlek area near Rotterdam.

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The alumina processed was obtained from the Surinam plant of Surinam Aluminum Co. (Suralco), a subsidiary of the Aluminum Company of America, which used as raw material bauxite mined by a Surinam subsidiary of the Netherlands Billiton concern.

Hoogovens and Billiton have organized a joint sales subsidiary, Aluminium-Nederland (Alumined), to market their two-third share of aluminum production. Alusuisse will distribute its one-third share of output.

The Alusuisse anode plant at Botlek has an annual output capacity of 120,00 tons. Three furnaces were in operation at yearend and a fourth unit was to be activated in 1968 or early in 1969, raising annual capacity to 160,000 tons. Plans provide for eventual expansion to 500,-000 tons yearly. Output of the plant is distributed between Aldel in the Netherlands and Alusuisse smelters in West Germany, Norway, and the United States.

There have been no further reports concerning a second aluminum smelter to be located in Limburg Province or of plans of the Aluminum Company of America (Alcoa) to build an aluminum oxide plant in the Botlek area.

Iron and Steel.—All sectors of the iron and steel industry operated at near capacity levels in 1967: Sinter output advanced 8.1 percent; pig iron and ferroally production was 16.7 percent higher; and output of steel ingots and rolled steel increased 4.5 percent and 5.5 percent, respectively. About 63 percent of the total steel output was produced by the oxygen process. The value of iron and steel produced exports rose 12.7 percent in 1967, while the value of imports increased 7.9 percent. Consumption of steel, which increased 6 percent in 1966, was down 1.4 percent during the first 9 months of 1967 as compared with the same period in 1966.

Royal Netherlands Blast Furnaces and Steelworks (Hoogovens) of Ijmuiden near Amsterdam has a far-reaching $280 million expansion program designed to achieve an annual steel production of 4 million tons by 1971 and 6 to 7 million tons soon thereafter. In 1966 company steel output increased 2.7 percent to 2.9 million tons, but pig iron production at 2.2 million tons was off 7 percent because of the temporary shutdown of one blast furnace. A company report covering the first 9 months of 1967 indicated that production and sales of steel and pig iron were substantially higher than in the comparable period in 1966.

A new blast furnace (the sixth), which became operative in November 1967, has a production capacity of more than 3,000 tons every 24 hours. Capacity will be increased to 4,000 tons in 1970 when pellets from a $22 million pellet plant under construction are used. The pelletizing plant, the first to be constructed in the European Coal and Steel Community (ECSC) countries, will have an annual rated production capacity of 2.5 million tons, all to be used by Hoogovens. Work also progressed satisfactorily on a second oxygen-blown steel unit and an ore quay scheduled for completion in mid–1968. The latter will accommodate carrers of up to 100,000-ton capacity.

Royal Demka Steelworks, Utrecht, a subsidiary of Hoogovens, discontinued stainless steel production early in 1967. Activities were to be restricted primarily to bar and rod rolling, wire, steel casting, and some electric steel production.

A new electrolytic tinplate mill (the third) was put into operation hy Hoogovens in August 1967 expanding annual production capacity of electrolytic tinplate from the previous level of 350,000 to 580,000 tons. The new mill is 125 meters long, has 10 tinning tanks and will supply tinplate in rolls.

Molybdenum.—The molybdenum conversion plant of Climax Molybdenum Co. N.V. near Rotterdam, which initiated operation in April 1966, supplied technical-grade molybdic oxide to European and Japanese customers throughout 1967. During the second half of the year, the plant produced considerably above the nominal 5,500-metric-ton annual capacity.

Tin.—Production of primary tin rose 9.5 percent, while ore imports increased about 12 percent in 1967. Indonesia provided 84 percent of total imports; the remainder came mainly from Belgium, Republic of South Africa, and the Congo (Kinshasa). Domestic industrial tin consumption presumably will increase as a result of the new electrolytic tinplate mill installation by Hoogovens.

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NONMETALS

Building Materials.—Cement output rose by 5.9 percent in 1967, reflecting the continued high level of construction activity. Imports increased 78,000 tons while exports were up 8,000 tons. Cementfabriek Ijmuiden N.V. (CEMIJ) and Cementfabriek Rozenburg N.V. (Rozenburg Cement Works) at Rozenburg, two of the three operating plants in the Netherlands, built new mills each with a capacity of more than 300,000 tons per year. The Rozenburg plant has been designed to permit expansion to 1 million tons yearly.

Fertilizer Materials.—Production of nitrogenous and phosphatic fertilizers increased 16 percent and 3 percent, respectively, in 1967, while output of potassic fertilizers remained virtually unchanged. Output of sulfuric acid (100 percent H_2SO_4) increased to 1.2 million tons, an increase of 10 percent from that of 1966. Both exports and imports of fertilizers decreased in 1966. Exports of nitrogenous fertilizer and superphosphates declined to 442,000 tons (down 47 percent) and 290,000 tons (down 23 percent), respectively. Imports of phosphate rock (783,000 tons) were down almost 4 percent in 1966, while those for potassic fertilizer (411,000 tons) were up slightly.

During 1967, new production units were put into operation, including a sulfuric acid plant, an evaporator for sulfuric acid, a diamonium phosphate and urea plant, and an ammonia plant. In addition, facilities for expanded output of nitric acid and calcium amonium nitrate became operative during the year.

MINERAL FUELS

The structural changes taking place in the Netherlands energy market continued to adversely affect the position of coal in 1967 as natural gas and, to a lesser extent, petroleum fuels absorbed the bulk of the rising energy requirement and made added inroads in most coal markets. Solid fuel's share of the Netherlands energy market fell from 24 percent in 1966 to 21 percent in 1967, and that for liquid fuels declined for the first time in the post-World War II years from 69 percent in 1966 to 68 percent in 1967. In contrast, the share of natural gas increased to 11 percent in 1967 from 7 percent in 1966 as consumption more than doubled.

In line with Government plans to promote the use of natural gas and to provide for an orderly cutback in production and use of the much more costly indigenous coal, the share of coal in energy markets is expected to fall to 7 percent by 1975, with that for natural gas rising to 27 percent, and petroleum fuels remaining rather stable at 66 percent. However, government aid to the coal industry, including subsidies to stimulate select coal markets, continued.

Coal.—Coal production fell sharply in 1967 as plans were accelerated for coal mine closures and reduction of output from remaining mines to a level more in line with demand. There were also significant declines in output of coal briquets and coke. Pit-head stocks of coal reached a record high of 1.7 million tons in April, but fell to 1.3 million by September 30. During the first 9 months of 1967, coal consumption was down 16 percent from the comparable period in 1966 with deliveries to coke plants, households, and electric power stations off 19, 19, and 2 percent respectively. Partial shutdown of the Emma mine and coke plant was responsible for the fall in coal deliveries for coking purposes. In the case of deliveries to households, however, the decline stemmed chiefly from consumer shifts to natural gas and petroleum fuels, a trend expected to continue.

Coal mine worker employment fell by 22 percent from the end of June 1966 to the close of June 1967, while worker productivity rose about 5 percent.

Government plans for closing additional production capacity, merging mines, and lowering output levels of remaining units, are designed to reduce output of coal to 7 million tons in 1968 and to about 5.6 million tons in 1970. Suspension of operations at the Maurits mine and the reduction of output at the Emma-Hendrik mine were to be followed by closure of the Wilhelmina State-owned mine in 1969 instead of in 1970 as originally planned; shutdown of the Domaniale private mine in 1970; suspension of operations at the Oranje-Nassau IV private mine; and merger of the private Laura and Veresniging mines.

Meanwhile, the Government offered investment incentives to bring new capital

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and industry to depressed coal mining areas in South Limburg, and programs have been initiated to retain displaced miners for other jobs through funds made available by the Netherlands Government and the ECSC. Under the accelerated plan for mine closures, some 8,200 coal mine workers will become redundant during 1968–72, and many of these would qualify for new job training.

The Government is slated to continue subsidy payments to the remaining producing coal mines, mostly in the private sector, to permit an orderly reduction in coal output. Principal beneficiaries will be Oranje-Nassau Mijnen, the Willem-Sophia, mine, and the Laura-Veresniging, mines, employing a total of 16,000 workers. Coal imports will continue to be restricted to essential needs, mainly from ECSC member countries. In 1967 more than 7 million tons were imported, with West Germany (62 percent), the United States (17 percent), and Belgium (13 percent), as major suppliers. A feature of this trade was the rise in imports from West Germany and the decline in the United States share of the market (17 percent versus almost 29 percent in 1966). Netherlands higher level of coal imports from West Germany stems mainly from the price decline due, no doubt, to sales made at distress prices by West Germany to reduce record mine stock accumulations.

Petroleum and Natural Gas.—The major event of 1967 was the opening of the Netherlands portion of the North Sea Continental Shelf to exploration for oil and gas. The Government completed necessary legislation, initiated more than 2 years earlier, by issuance of a General Administrative Order in July 1967. This order, the Continental Shelf Mining Act of 1965, and regulations issued January 27, 1967, form the legal basis for oil and gas exploration. During 3 months following August 16, 1967, applications were received for oil and natural gas exploration licenses from 20 applicants representing 62 companies. Licenses were subsequently granted to 18 applicants to March 7, 1968. Eighteen United States companies were among the members of the consortia that received licenses. The Government allocated 102 blocks of 400 square kilometers each from among the more than 180 blocks available. The remaining blocks will be considered November 1968, if there is sufficient interest. The heaviest concentration of allocated blocks was in the area parallel to the Netherlands' west coast and adjacent to the British sector where natural gas had already been discovered.

Licenses are valid for 15 years and exploration must begin within 8 months. Holders must spend a minimum of $1,657 per square kilometer for each of the first 5 years and at least $3,315 annually for the following 5 years. A bonus of $276 per square kilometer is payable, as well as an annual surface rental of $13.81 per square kilometer during the first 5 years, $27.62 during the second 5 years, and $41.50 during the remaining years. After 10 years, the area for which a license is granted must be reduced by one-half. License holders who prove an economically producible quantity of crude oil or national gas (not less than 100 cubic meters per day of oil or 100,000 cubic meters per day of gas) are entitled to a production license.

The terms of Production Licenses laid down by the General Administrative Order provide for capital participation by the Netherlands Government not to exceed 40 percent of the capital in those companies producing substantial quantities of natural gas. A production license is granted for 40 years. Surface rental is $84 per square kilometer per year. This is affected by movements in the wage index. A bonus of $276 per square kilometer is not required if already paid to acquire a prospecting license. The license holder pays the Government a percentage of the ex-wellhead value of output on a sliding scale ranging from 2 to 16 percent for oil and 1 to 16 percent for natural gas. The Government is to receive 50 percent of the profits. Oil may be freely disposed of. Gas can be disposed of after approval of the selling price by the Minister of Economic Affairs. With the exception of any gas already contractually committed, gas required for the local market will be sold to N.V. Nederlandse Gasunie, taking into account a period of notice of 2 years.

Instruments of ratification were exchanged betweeen the Netherlands and the United Kingdom in December 1966, bringing into effect the two Continental Shelf treaties signed October 6, 1965 providing for the delimitation of the respective national boundaries in the North Sea Con-

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tinental Shelf and for the rational exploitation of mineral resources that may extend across the demaraction line.

In August 1967, the Netherlands and Denmark exchanged the instruments of ratification of a treaty delimiting their respective boundaries in the North Sea Continental Shelf, which had been signed March 31, 1966.

The dispute between the Netherlands, Denmark, and West Germany over their respective boundaries in the North Sea Continental Shelf was referred to the International Court of Justice in The Hague during 1967.

New onshore drilling permits were granted on three occasions during 1967. Companies receiving concessions and respective areas covered in hectares were the California Asiatic Oil Company and Texaco Overseas Petroleum Co.—64,820; Nederlandsche Aardolie Maatschappij (NAM)—1,069,450; Petrofina—67,920; Petroland N.V.—116,031; Chevron Oil Co./ Texaco Overseas Petroleum Co.—115,011; Dow Chemical International, Ltd./Continental Netherlands Oil Company—13,951; the consortium of Amoco/ Gelsenkirchener Bergwerks A.G./Exploratie Mij.—109,267. These permits are vaild for 2 years but will be extended to a maximum of 5 years if satisfactory progress is made.

Petroleum.—Domestic crude oil production amounted to 2.3 million tons in 1967, 4 percent below that of 1966 and equivalent to about 11 percent of inland consumption of oil products. Crude output has increased only marginally since 1962 and continued to represent a diminishing proprotion of inland consumption, which rose by 5.5 percent in 1967. Because of availability of locally produced natural gas, the rate of increase in oil consumption has been declining.

The decision of the City of Rotterdam and the Netherlands Government taken in 1967 to deepen the 12-kilometer channel from the North Sea approach to Rotterdam's Europoort, set off a wave of new investment in the petroleum and petrochemical industries in the port area. The channel will render Rotterdam/Europoort accessible to tankers of up to 225,000 tons deadweight by 1969. Encouraged by this project and increased natural gas availability, many industries announced expansion programs and other investments amounting to about $300 million since the channel project was approved.

By yearend 1969, the area's annual oil refining capacity, 38 million tons at yearend 1967, is expected to reach 57 million tons. Shell plans to increase the daily capacity of its Pernis refinery from 340,000 barrels to nearly 500,000 barrels at a cost of $35 million. Esso Nederland NV announced in July 1967 that it would raise the daily capacity of its Botlek refinery from 150,000 to 325,000 barrels by the second half of 1969 at a cost of over $50 million. Chevron Oil Europe announced September 6, 1967, that it would increase the daily capacity of its 100,000 barrel Rotterdam refinery to 250,000 barrels yearend 1969. Formerly a Caltex operation, this refinery is now owned 68.4 percent by Chevron Oil Europe (a subsidiary of Standard Oil of California) and 31.6 percent by Texaco, Inc. The estimated cost of the expansion was $55 million.

In 1967, Shell Nederland Chemie brought on stream a large ethylene complex. Capacity of several existing petrochemical units at Pernis were enlarged, and a new plant to manufacture vinyl esters was brought on stream.

British Petroleum Co. Ltd. (BP), opened a 100,000 barrel-per-day refinery at Europoort July 24, 1967. Begun in December 1964, its estimated construction cost was $69 million. At the refinery opening, BP announced plans for the construction of a $7 million crude oil terminal at Europoort, which would be supplied by tankers of up to 250,000 tons; smaller tankers will move crude from the terminal to BP refineries in Antwep, Belgium and Wilhelmshafen, Hamburg, and Gothenburg West Germany.

Other projects announced in 1967 were a $60 million chemical complex to be built by the Gulf Oil Corporation adjacent to its Europoort refinery to be completed by yearend 1969; the doubling of the capacity of Esso Chemie N.V.'s aromatics plant in the Botlek area of Rotterdam from 300,000 to 600,000 tons by 1970 at a cost of about $22 million; and the expansion of The Dow Chemical Co.'s petrochemical complex at Terneuzen to include a 400,000-ton naphtha cracking unit and a 60,000-ton polyethylene facility to be completed late in 1969, bringing Dow's investment there to $200 million. Other Dow

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projects call for the doubling by late 1968 of capacity for styrene production and construction of facilities for chlorinated solvents. An ethylene oxide plant was completed in 1967. The Dutch State Mines (DSM) completed in November 1966 an expansion to raise ethene production at Beek to 135,000 tons annually. In July 1967, DSM brought its new 70,000-ton urea plant on stream at Geleen upping capacity to 250,000 tons per year and completed its fourth nitric acid plant increasing total output to about 115,000 tons per year. DSM planned to build a new plant in Geleen to produce 45,000 tons of nitrile per year by the first half of 1969.

Mobil Oil N.V. was constructing an 80,000 barrel-per-day refinery in the Amsterdam port area. Scheduled for completion in June 1968, the refinery will be supplied with crude oil from Europoort through an 80-kilometer pipeline with a 400,000 barrel-per-day capacity. The pipeline project is a joint effort of the Netherlands Government and the City of Amsterdam.

The construction of a second crude oil pipeline from Rotterdam to the Rhine to meet the growing requirements of West German refineries in the Rhur area was begun in 1967 with completion scheduled for 1968. The 170-kilometer 36-inch pipeline from Rotterdam to Venlo was being financed by N.V. Rotterdam-Rijn Pijpleiding Mij, a group of oil companies. Estimated cost of the 720,000-barrel-per-day line is $39 million.

Natural Gas.—Production the natural gas more than doubled in 1967, duplicating the performance in 1965 and 1966. Sales in the domestic market of nearly 6,000 million cubic meters were about 70 percent higher than in 1966 and natural gas now accounts for approximately 11 percent of the Netherlands energy consumption. More than 1,000 million cubic meters were exported, setting new export records. Domestic sales were aided by completion of additional distribution pipelines and by progress in conversion of consumer appliances, 90 percent finished by yearend 1967 and expected to be completed in 1968.

At yearend 1967, Gasunie's pipeline network totaled some 5,900 kilometers of pipelines, including more than 1,300 kilometers of main feeder lines. The 1967 program consisted of an extension of the network by 650 kilometers, of which 225 kilometers was main feeder line, including a 160-kilometer, 42-inch line looping the pipeline connecting the Slochteren field with the Arnhem area and a 65-kilometer, 36-inch line between Direhuis and Voorschoten. The latter line will offer Rotterdam, Amsterdam, and The Hague the security of both legs of the supply pipeline from the Groningen field. Contracts were let for a 78-kilometer line between Tusschenklappen (directly south of Slochteren) and Balkburg, and an 81-kilometer line between Balkburg and Angerlo (east of Arnhem). Also under construction in 1967 were a 30-kilometer, 30-inch extension from the Rijndijk area near Leiden to Ridderkerk, south of Rotterdam and an 18-kilometer, 18 inch line from Goes in Zeeland province to the Sloe industrial area near Vlissingen. The estimated investment by Gasunie in the 1967 program was nearly $100 million.

Plans of Nederlandse Gasunie for 1968 envisaged the construction of more than 350 kilometers of pipelines, including more than 170 kilometers of 42–inch main feeder lines. Plans also provided for three compressor stations with a total capacity of 45,000 horespower, the first slated for operations in the winter of 1969–70. Gasunie estimated its financing requirements at $95 million.

Export of natural gas to West Germany and Belgium by NAM Gas continued to increase at an accelerating rate and delivery of natural gas to France began in 1967. Sales increased more than seven–fold compared with those of 1966 and the Netherlands Minister for Economic Affairs forecast an additional four–fold increase for 1968.

The 36/30-inch export pipeline from the Netherlands to Belgium and Northern France was completed to Paris in late 1967 Branch lines were being built in Belgium to connect Brussels, Hasselt, Leuven, Namur, and Ostend to this main with completion set for yearend 1968. Export lines to West Germany were being extended to the Rhine-Ruhr area. A separate 24-inch pipeline from the Netherlands-West German frontier region was being extended via Hamburg to the Baltic coast.

Contracts signed between NAM Gas Export and West German companies, Dis-

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trigaz of Belgium and Gaz de France by the end of 1967, called for estimated deliveries of 20.6 billion cubic meters (727 billion cubic feet) annually by 1975.

A new official estimate of the natural gas reserves of the Slochteren field by the Geologische Dienst (Department of Geology) placed proven reserves at 1,650 billion cubic meters (58,300 billion cubic feet) in April 1967, an increase of 50 percent over the November 1965 official estimate. The Geologische Dienst also stated that depending upon the method of extraction used, the proven reserves could amount to as much as 1,904 billion cubic meters. The new estimated were based on further seismic studies and test drilling in 1965 and 1966. This established the Slochteren field as having the largest natural gas reserves in the world. The new estimates increased the total proven reserves of natural gas in the Netherlands to 1,709 billion cubic meters. These included an estimated 59.1 billion cubic meters in the provinces of Friesland (including the Wadden Sea area), Drente, and North Holland whose reserves were revised slightly upward in January 1967.

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The Mineral Industry of New Zealand

By John A. Stock [1]

The value of New Zealand's mineral production increased 6 percent in 1966 to $69.52 million, but was followed by a decrease of 15 percent in 1967 to $58.89 million.[2]

Although the value of metals produced increased during 1967, it was insufficient to offset the large decreases in value of nonmetals and fuels produced. Because of the relatively large tonnages involved, the nonmetallics sand, rock, gravel, and agricultural limestone were the primary influences on both the 1966 increase and the 1967 decrease. The 1967 decline may be only a periodic softening of a general uptrend, but the continuing downtrends in coal and petroleum production magnify periods of reduced output. Nonmetallics were valued at $47.3 million in 1966 and $39.9 million in 1967, more than two-thirds of the total value of mineral production for each year as shown in the following tabulation:

Year	Percent			Total value, million dollars [1]
	Metals	Nonmetals	Fuels	
1950	10.8	22.5	66.7	26.07
1955	2.3	54.8	42.9	44.07
1960	2.2	55.2	42.6	55.33
1965	.7	66.4	32.9	65.78
1966	.5	68.0	31.5	69.52
1967	1.0	67.7	31.3	58.89

[1] Exclusive of cement, manufactured fertilizers, and products of the New Zealand Refining Co. Ltd. at Whangarei.

The mineral production value in 1966 was equivalent to 1.3 percent of the estimated gross national product. Employment in mines and quarries declined from 0.8 to 0.7 percent of estimated total employment between 1965 and 1966. Distribution of mine and quarry employees by product categories in recent years was as follows:

	1962	1963	1964	1965	1966
Metals, including gold	127	117	98	160	77
Nonmetals	3,927	3,977	3,885	4,136	3,623
Coal	3,852	3,660	3,631	3,447	3,359
Petroleum prospecting	153	112	157	46	65
Total	8,059	7,866	7,771	7,789	7,124

Interest in minerals in New Zealand has been stimulated in recent years by foreign exchange problems, efforts toward greater industrialization, and a number of successful mineral discoveries. Promotion and direction of mineral activity has been administered by the recently formed Mineral Resources Committee. At yearend 1966, there were 316 petroleum licenses in effect covering 111,000 square miles of land and Continental Shelf areas, 24 fewer than at yearend 1965. Although interest

[1] Mining engineer, Division of International Activities.

[2] New Zealand adopted decimal currency on July 10, 1967 on the basis of INZ£ equals 2NZ dollars. Subsequently (November 21, 1967) the NZ dollar was devalued bringing the exchange rate to about US$1.12. For all values given herein conversion has been at the 1966 rate of NZ£1 equivalent to US$2.781.

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in North Island's onshore oil possibilities apparently has declined, the number of licenses for South Island and Continental Shelf areas has increased. Mining privileges granted in 1966 numbered 297, a decrease from 301 in 1965, but the 1966 total included increases in mineral claims and licenses and coal mining rights.

Direct Government financial assistance to the mining industry in the year ending March 31, 1967, included grants totaling $49,193 for 13 projects.

PRODUCTION

In 1966 metallic mineral production was slightly below the 1965 level. Gold output in 1966 was 26 percent below 1965, but indications of increased future yields from alluvial ground and new vein prospects were confirmed to some extent in 1967 by a 19 percent increase in output of gold to 10,703 ounces. Coal output in 1967 was

Table 1.—New Zealand: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Copper ore, gross weight	234	736	144	-------	152
Gold, troy ounces	14,206	8,948	12,136	8,965	10,703
Iron ore, gross weight	3,123	2,591	2,272	2,666	2,616
Silver, troy ounces	286	141	55	2	-------
Tungsten ore, gross weight	5	5	-------	3	16
Nonmetals:					
Asbestos	398	-------	-------	-------	-------
Bentonite	1,687	1,835	2,973	r 2,455	3,102
Cement	722,000	787,800	841,844	878,000	813,856
Clay:					
Pottery, etc	7,837	5,961	7,541	8,561	7,784
Structural types	293,859	304,221	360,145	r 305,612	286,406
Diatomite	1,629	1,706	1,757	4,735	1,431
Dolomite	4,457	9,311	7,677	13,464	8,443
Fertilizers, manufactured superphosphate, thousand tons	1,480	1,795	1,968	r 1,953	1,593
Kauri gum	44	38	41	49	25
Limestone:					
Agricultural and industrial, thousand tons	929	1,247	1,163	r 1,156	1,040
For cement, do	1,206	1,362	1,498	r 1,700	1,519
Magnesite	794	613	850	566	577
Perlite	573	929	1,142	r 1,045	1,072
Pumice	16,873	20,847	109,594	18,329	16,403
Salt	11,177	21,674	34,718	36,019	56,086
Sand, rock and gravel, thousand tons	20,071	19,900	r 25,568	r 28,963	24,196
Serpentine, do	136	137	r 140	141	90
Silica (glass) sand	64,844	43,945	r 75,425	92,419	80,412
Stone, dimension	12,681	20,887	4,376	9,697	35,148
Mineral fuels:					
Coal:					
Anthracite, thousand tons	(1)	(1)	(1)	r (1)	(1)
Bituminous, do	671	693	674	642	594
Subbituminous, do	1,951	2,071	1,867	1,826	1,643
Lignite, do	164	159	160	168	169
Total, do	2,786	2,923	2,701	2,636	2,406
Coke:					
High temperature, do	6	6	6	6	5
Low temperature, do	78	80	69	67	56
Fuel briquets, do	11	15	18	r 19	20
Natural gas, million cubic feet	3	5	5	4	4
Condensate, thousand 42-gallon barrels	4	4	(1)	NA	-------
Petroleum:					
Crude, do	4	4	5	4	3
Refinery products:[2]					
Gasoline, total, thousand 42-gallon barrels	-------	2,094	8,253	9,625	8,818
Distillate fuel oil, do	-------	833	3,378	3,467	7,377
Residual fuel oil, do	-------	1,179	4,893	4,150	836
Other products, do	-------	48	279	1,565	590
Refinery fuel and loss, do	-------	249	609	1,618	1,882
Total, do	-------	4,403	17,412	20,425	19,503

r Revised. NA Not available.
[1] Less than ½ unit.
[2] Estimates based on latest available data.

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lower than any preceding year since 1960, in part as a result of an explosion in the Strongman mine. In 1966 production increased among the nonmetals, notably cement, diatomite, dolomite, silica sand, and dimension stone, but in 1967 all these decreased. Crude petroleum declined in 1966 and continued this trend through 1967.

TRADE

New Zealand's mineral commodity exports increased in 1966, reaching a value almost twice that attained in 1965, but mineral commodity imports continued to increase more rapidly than exports, resulting in a growing trade deficit in mineral commodities. The trend in mineral and total trade values for 1965–66 is as follows:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	7.1	979.3	0.7
1966	13.2	1,058.1	1.2
Imports:			
1965	244.5	1,044.8	23.4
1966	259.2	1,085.5	23.9
Trade balance:			
1965	−237.4	−65.5	XX
1966	−246.0	−27.4	XX

XX Not applicable.

Refined petroleum products were New Zealand's most important mineral export category with a combined value of about $7 million in 1966, almost double the 1965 value. In second place, exports of nonferrous metal scrap and semimanufactures were valued at $4.8 million.

Iron and steel, valued at nearly $88 million, again ranked first among mineral commodity import groups in 1966, followed by fertilizers valued at $49 million. The $12 million increase in fertilizer imports compared with 1965 imports reflected Government aims to increase grazing land yield. Changes in the pattern of petroleum imports resulted from the start up of a new refinery at Whangarei. Refined product imports declined from $60 million in 1964 to $26 and $27 million in 1965 and 1966, respectively, while imports of partly refined petroleum increased from $4 million to $30 million between 1964 and 1966 and imports of crude petroleum increased from $15 million to $23 million during the same period. Imports of unwrought and semimanufactured copper at $19 million and sulfur at $9 million in 1966 were significant in that each showed an increase of about 50 percent above the 1964 value.

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Table 2.—New Zealand: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum and its alloys:			
Scrap	717	555	West Europe 188; Japan 180; Australia 177.
Unwrought and semimanufactures	127	205	South Korea 90; Australia 52.
Copper:			
Ores and concentrates	------	41	West Germany 20.
Metal and alloys:			
Scrap	840	2,113	Japan 814; West Germany 620; Belgium-Luxembourg 214.
Unwrought and semimanufactures.	1,017	2,963	Japan 802; West Germany 642; Belgium-Luxembourg 463.
Iron and steel:			
Scrap	399	2,399	Netherlands 1,594; Japan 733.
Semimanufactures	178	123	Australia 80.
Lead and its alloys:			
Scrap	1,139	625	West Europe 431; Republic of South Africa 133; Australia 61.
Unwrought and semimanufactures	1,040	174	Belgium-Luxembourg 81; Australia 28.
Tin and its alloys:			
Scrap, long tons	r 4,770	2,542	Netherlands 2,050; Japan 487.
Unwrought and semimanufactures, do	8	------	
Nonmetals:			
Abrasives, natural, value, thousands	$33	$28	Australia $24.
Cement, lime, and fabricated building materials, do	$93	$173	Fiji $113; Western Samoa $32; other Oceania $27.
Clay and refractory building materials, do	$43	$46	Fiji $38.
Fertilizer materials:			
Crude	987	1,194	Australia 650; Malaysia 157; Singapore 152; Japan 102.
Manufactured fertilizers	------	951	Fiji 520; Western Samoa 426.
Mineral fuels:			
Bituminous materials from coal and petroleum.	1,480	------	
Petroleum, refinery products:			
Gasoline, value, thousands	$19	$31	French Polynesia $18; Fiji $13.
Fuel oils:			
Distillate, do	$1,372	$3,002	Ships bunkers $2,834; Philippines $125.
Residual, do	$2,372	$3,929	Ships bunkers $2,210; Japan $609; Singapore $357.

r Revised.

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Table 3.—New Zealand: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Oxides and hydroxides	269	547	Australia 351; West Germany 117.
Metal and alloys:			
Unwrought	9,228	6,669	Canada 4,412; Australia 1,443; United States 729.
Semimanufactures	2,752	3,864	Canada 2,438; United Kingdom 479.
Arsenic oxides and acids	144	139	NA.
Chromium oxide and hydroxide	203	149	West Germany 64; United Kingdom 40; Australia 23.
Copper and its alloys:			
Unwrought	228	276	Republic of South Africa 205; United Kingdom 60.
Bars, wire, etc	7,282	7,544	Australia 5,403; United Kingdom 1,861.
Plate, sheet, strip	2,855	2,135	Australia 1,015; United Kingdom 821; Canada 288.
Pipes, tubes, and fittings	4,352	3,900	Canada 1,767 Australia 1,409; United Kingdom 705
Iron and steel:			
Pig iron and blast furnace products	8,775	8,882	Australia 7,115; Republic of South Africa 790.
Primary forms	152	208	Australia 89; United Kingdom 88; Austria 24.
Semimanufactures:			
Rods, bars and sections	206,341	161,433	Australia 92,228; United Kingdom 33,173; Japan 29,349.
Universals, plates and sheets	207,938	197,343	Australia 107,245; Japan 46,636; United Kingdom 37,406.
Hoop and strip	13,982	12,768	United Kingdom 4,621; Australia 3,908; Japan 3,194.
Rails and track materials	13,863	21,279	Australia 13,322; United Kingdom 6,414.
Wire	35,960	24,006	Australia 12,208; United Kingdom 6,812; Belgium-Luxembourg 2,481.
Pipes, tubes and fittings	48,626	54,282	United Kingdom 30,093; Australia 19,867.
Lead:			
Oxides	985	1,016	Australia 878; United Kingdom 112.
Metal and alloys:			
Unwrought	6,561	7,478	Australia 7,380.
Semimanufactures	36	57	United Kingdom 34.
Magnesium, unwrought	83	---	
Manganese oxides	289	451	United States 288; Australia 119.
Mercury, 76-pound flasks	58	116	United Kingdom 29; Spain 29; West Europe 29.
Nickel and its alloys:			
Unwrought	59	40	United Kingdom 33; Canada 7.
Semimanufactures	205	204	Canada 118; United Kingdom 69.
Silver, unworked and partly worked, thousand troy ounces	1,628	1,679	Australia 1,196; United Kingdom 451.
Tin:			
Oxides, long tons	9	12	Australia 6; United Kingdom 6.
Metal and alloys:			
Unwrought, do	456	364	Malaysia 334.
Semimanufactures, do	13	22	United Kingdom 16.
Titanium oxides	3,328	911	Japan 559; Australia 290.
Zinc:			
Oxide and peroxide	59	---	
Metal and alloys:			
Unwrought	3,670	4,895	Australia 4,873.
Semimanufactures	764	884	Australia 603; United Kingdom 209.

See footnotes at end of table.

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Table 3.—New Zealand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals:			
Asbestos, crude	7,854	7,856	Canada 5,175; Republic of South Africa 2,455.
Barite (barium sulfate)	729	1,227	Australia 688; West Germany 486.
Cement:			
Construction types	3,192	3,468	United Kingdom 1,639; Japan 844; Denmark 696.
Refractory cement and mortar	947	1,004	United Kingdom 714; United States 156.
Chalk	1,227	1,294	France 577; United Kingdom 396.
Clay and similar refractory materials, crude.	4,560	6,495	United States 2,891; United Kingdom 1,670; Republic of South Africa 1,277.
Feldspar, fluorspar and nepheline syenite	1,386	1,017	Sweden 656; United Kingdom 195.
Fertilizer materials:			
Crude, natural:			
Sodium nitrate	3,821	3,962	Chile 3,345; Belgium-Luxembourg 615.
Phosphates	867,218	1,268,970	Nauru, Ocean, Christmas Islands 724,541; United States 290,042; Polynesia 135,335.
Manufactured:			
Phosphatic, including basic slag	19,627	26,648	United States 15,019; Belgium-Luxembourg 11,206.
Potassic	167,841	152,774	Canada 113,159; United States 35,302.
Graphite, natural	54	198	United Kingdom 160.
Gypsum and plasters	109,341	107,429	Australia 105,860.
Infusorial earths	791	815	United States 790.
Lime	331	372	United Kingdom 362.
Magnesite	178	371	India 202; Australia 147.
Pigments, including titanium and iron oxides.	5,363	2,994	Australia 1,301; Japan 600; West Germany 350; United States 314.
Quartz and quartzite	725	1,741	Belgium-Luxembourg 1,420; Australia 301.
Salt	50,130	49,852	United Kingdom 33,734; Australia 12,314.
Stone, sand and gravel:			
Building, dimension stone, and slate	1,037	1,169	United Kingdom 261; Sweden 231; Republic of South Africa 227; Italy 213.
Sand, gravel and crushed stone	1,357	536	Australia 459.
Sulfur, industrial and pure grades	181,700	235,980	United States 130,117; Canada 50,407; Mexico 42,549.
Talc and steatite	1,666	1,398	Australia 1,151.
Mineral fuels:			
Coal	2,978	54,045	Australia 54,042.
Coke and briquets	123	101	All from West Europe.
Bitumen, natural	722	422	Trinidad 405.
Carbon black	4,009	4,228	Australia 1,788; United States 1,664; United Kingdom 732.
Petroleum:			
Crude—thousand tons	1,514	1,373	Kuwait 730; Iran 360; Saudi Arabia 151.
Partly refined, thousand 42-gallon barrels	5,984	11,412	Kuwait 6,917; Saudi Arabia 1,386; India 1,229.
Refinery products:			
Gasoline—do	2,017	1,452	Australia 605; Iran 298; Venezuela 284; Saudi Arabia 165.
Kerosine—do	996	1,424	Australia 418; Indonesia 371; Iran 306; Malaysia 155.
Fuel oils:			
Distillate—do	945	1,149	Australia 231; Saudi Arabia 162; Venezuela 152; Singapore 133.
Residual—do	268	252	All from Singapore.
Mineral jelly and wax	3,955	2,790	United States 1,665; Indonesia 559.
Lubricants—value, thousands	$5,464	$6,155	Australia $2,688; United States $1,796; United Kingdom $1,547.
Nonlubricating oils, thousand 42-gallon barrels	47	79	Indonesia 33; United States 21; Iran 12.
Other—thousand tons	19	2	Mainly from Australia.
Mineral tar from coal, petroleum or gas, thousand 42-gallon barrels	4	9	All from United Kingdom.

NA Not available.

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COMMODITY REVIEW

METALS

Bauxite and Aluminum.—No activity has been reported regarding bauxite occurrences near Kaeo, Kerikeri and Otoroa in North Auckland since 1965, when beneficiation tests were conducted.

In 1960 an agreement was made between the New Zealand Government and Commonwealth Aluminum Corporation Ltd. (Comalco) of Australia for Comalco to erect a smelter at the port of Bluff on the South Island, but for various reasons, construction had not started by yearend 1967. The projected smelter will have annual capacity to process 210,000 tons alumina from Australia, using power from a New Zealand Government hydroelectric project being built at Lake Manapouri, 160 kilometers from Bluff.

Interest in the smelter project in 1966 by two Japanese companies (Showa Denko K.K. and the Sumitomo Chemical Co. Ltd.), followed by extensive negotiations, was finally culminated by a Government announcement in July 1968 that these companies have agreed to join Comalco in the construction and operation of the smelter. Output of metal (70,000 tons) is scheduled for 1971 and full capacity production of 105,000 tons of aluminum per year is contemplated in 1972. Cost of the smelter-hydroelectric power scheme has been estimated at $445 million, including $90 million for the smelter. Comalco has until December 1, 1968 to decide whether to exercise its option on Manapouri power.

Copper.—In the southwest part of Coppermine Island of the Hen and Chickens group off the North Island coast a disseminated copper deposit averaging 0.5 percent copper has been reported with reserves estimated at 500,000 tons "almost certain" and 22 million tons possible. Efforts of Conzinc Rio Tinto of Australia Ltd. to obtain prospecting rights on this island met resistance from the Government because it is a national park and scenic reserve. However in late 1967, a Parliamentary Committee refused to condone further delays or prohibitions on copper prospecting on Coppermine and Whatupuke Islands. It recommended that initial prospecting be permitted subject to conditions of the Nature Conservation Council, and that further prospecting be considered in the light of findings. Conzinc's entry into these areas for prospecting at yearend was subject to the approval of the Minister of Lands.

New Zealand Developments Ltd. of Christchurch was formed to work copper occurrences in the Moke Creek area near Queenstown, South Island. This deposit, first investigated by Mineral Industries Ltd., consists of thin stringers of pyrite, pyrrhotite, chalcopyrite, and other sulfides interlaminated with green schist, and is estimated to contain 50,000 tons of sulfides averaging 10 to 20 percent copper. Ore extraction presumably began about September 1966, but there were indications that mining might be discontinued because operations had not resulted in ore sales or assessment of the area's mineral potential.

Some interest was shown in the possibility of finding workable copper deposits in Northland and the Coromandel Peninsula where small occurrences have been known for many years.

Gold.—Virtually all of New Zealand's gold output was recovered along the Taramakau River in Westland by Kanieri Gold Dredging Ltd., which operates the country's only remaining gold dredge. Monthly dredge production ranged from 700 to 1,400 ounces but apparently fell below the 700-ounce figure in 1966. In late 1967 monthly recovery was reportedly about double that of the corresponding 1966 period. Small sluicing operations in 1966 accounted for a total of 320 ounces while quartz vein mining produced only 14 ounces.

Recent discoveries and exploration have given promise of increased gold production. The United Mining Company reported discovery of a rich quartz lode adjacent to the old Mount Greenland mine, 32 kilometers south and 16 kilometers inland from Hokitika. Activity at the site in 1967 included construction of an access road. In early 1967, mining leases were taken by Carpenteria Exploration Pty, Ltd. in the Thames area of North Island where gold veins have been worked in the past. Lime and Marble Ltd. has been exploring certain areas on the west coast of South Island with the object of using large modern equipment to obtain gold from gravels heretofore unworked because of lack of equipment. Waikakaho Mines Ltd. hopes to interest oversea mining com-

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panies in gold deposits in the Waikakaho area, about 27 kilometers north of Blenheim.

Iron and Steel.—New Zealand's iron ore output, limonitic ore obtained from small open pits, continued to be used locally in the manufacture of bricks, steel, and cement and in gas purification.

The New Zealand steel industry in 1967 was composed of two companies, the Pacific Steel Ltd. and GKN Steel Company (New Zealand) Ltd., both located at Otahuhu near Auckland. Pacific Steel utilizes local scrap in electric furnaces to produce about 65,000 ingot tons annually, which is further processed in its billet and merchant bar mills. Proposed expansion is expected to increase output to about 200,000 tons. GKN imports steel rod from Australia and the United Kingdom for use in its wire drawing mill which has a yearly capacity of 40,000 tons.

Demand for steel in New Zealand in 1965 reportedly totaled over 550,000 tons and an increase to 660,000 tons per year by 1970 was postulated.

By yearend 1968 the Glenbrook works of New Zealand Steel Ltd. is expected to begin production. This plant, under construction at Waiuku, 40 kilometers south of Auckland, is to utilize large indigenous iron sand reserves. The first product in 1968 will consist of galvanized sheet to be made from imported cold-rolled coil. The first steel furnace is scheduled to start up in the early part of 1969, and production is expected to be 190,000 tons annually by 1970 and possibly 600,000 tons by 1985.

The primary raw material source for the Glenbrook Works will be an iron sand deposit at Waikato Head, 13 kilometers from Waiuku, that is expected to yield 150 million tons of concentrate averaging 56.8 to 59.9 percent iron and 8 percent titanium dioxide. Sponge iron pellets made from the iron sands will be used in the Stelco-Lurgi direct reduction process. New Zealand Steel Ltd. was planning research aimed at economic recovery of byproduct ilmenite and zircon; associated vanadium-bearing materials may also prove economically recoverable. Reduction of the ore to steel will require 25 million tons of coal over a 50-year period. Ample reserves of suitable low ash coal are available 80 kilometers from Waikato Head in the Huntly area, and additional supplies are also available at Maramarua 48 kilometers away. Suitable limestone deposits have been found within 5 kilometers of Waikato Head and refractories, bentonite, and dolomite are locally available.

Lead and Zinc.—Small occurrences of lead and zinc mineralization have been reported at many locations in New Zealand but there was no commercially exploitable deposit known until 1963, when payable lead-zinc ore was discovered at the old Tui silver mine at Te Aroha, 130 kilometers southeast of Auckland. Norpac Mining Co. Ltd. was formed in 1965 as a joint venture of South Pacific Mines Ltd., North Island Mines Inc., and Cable Price Downer Ltd. to explore and develop this property. By 1966, ore reserves reportedly totaled between 100,000 and 500,000 tons averaging 5 percent lead, 15 percent zinc, and small quantities of copper, silver, and gold. A 100-ton-per-day flotation mill was scheduled for completion by July 1967. Although Norpac is attempting to determine if the concentrates can be processed in New Zealand, zinc concentrates initially will be exported for processing. In late 1967 Norpac completed a contract with the Mitsui Mining & Smelting Co. Ltd. to ship approximately 8,500 tons of Tui zinc and lead-copper concentrates to Japan during the year with shipments scheduled to begin in January 1968.

A lead-zinc deposit discovered near Takaka in Nelson Province, South Island, by Lime and Marble Ltd. of New Zealand, was prospected during 1966 and proved uneconomic.

Titanium.—Beach sands on the West Coast of South Island continued to hold the interest of a number of mining groups. Surface deposits surrounding Westport contain ilmenite, gold, and zircon. Magnetite also exists in the sands but in commercially insignificant amounts. Economic potential is mainly in the ilmenite with zircon and gold in sufficient quantities to be considered as bonus minerals. Incomplete studies indicate that ilmenite sands extend for 320 kilometers between Karamea River and Bruce Bay. In 1967, Buller Minerals Ltd. with about a 24,000-acre lease was studying the deposits in association with Rutile and Zircon Mines of Australia. Carpenteria Explorations Pty. Ltd. applied in 1966 for licenses covering almost 19,000

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acres, and has also established a separation laboratory and plans to do extensive sampling. Lime and Marble Ltd. of Nelson has begun a systematic drilling program and has set up a laboratory in Westport with electrostatic separation equipment. The Marine Mining Co. of New Jersey and the Planet Mining Company of Australia also have leases for West Coast area mineral surveys. Limited sampling has inferred that coastal beaches contain from 4.3 to 10.9 million tons of ilmenite and 0.4 million tons of zircon. If dune sands are included, the estimates become 12.6 to 20.5 million tons of ilmenite and 0.5 million tons of zircon.

Any New Zealand industry based on nonferrous beach sands will have to compete with the relatively large, established industry of Australia. Studies by the Department of Scientific and Industrial Research (DSIR) on samples of Westport ilmenite sands have shown that an ilmenite concentrate of 45 to 47 percent TiO_2 can be produced with acceptably low chromium and vanadium percentages. Concentrates of 61.1 percent zircon, with monazite are also produced. Nevertheless, investigations are still going on in four countries for upgrading the ilmenite by slagging or chemical methods. The amounts involved would make possible a long-term mining operations at 100,000 tons annually. Interest in the ilmenite deposits has been shown by the Ishihara Sangyo Kaisha Ltd., largest producer of titanium dioxide pigment in Japan. If the economics of the operation are favorable, especially low-cost power, this Japanese company has indicated that it would be interested in joining with Lime and Marble Ltd. to provide a processing facility.

NONMETALS

Bentonite and Other Clays.—Bentonite production originated chiefly from Porangahau, near the southeast coast of North Island. A description of substantial reserves of nonswelling bentonite in Canterbury Province of South Island was published in 1965.[3]

In 1966, investigations indicated large quantities of excellent quality bentonite in the Coalgate area. Pickands Mather & Co., International of U.S.A. with Canterbury Bentonite Ltd. (a subsidiary of Lime and Marble Ltd. of Nelson, New Zealand) studied these reserves to determine whether they could support an export industry. The Waiuku iron and steel project could provide an additional internal use for bentonite in the preparation of ironsand pellets. Drilling indicated 500,000 to 600,000 tons in beds 25 meters thick. Investigations were to include pilot plant tests in New Zealand and the United States.

Several million tons of high-quality halloysite clay have been defined by Lime and Marble Ltd. and Crown Lynn Potteries Ltd. in the Northland and Coromandel areas. The reserves indicated show an export potential for treated clay.

Cement.—Cement production in 1966 exceeded the record level of 1965 by 4 percent, but 1967 declined toward pre-1965 levels.

Dolomite.—Government emphasis on improving pasture lands probably accounts for the 75-percent increase in dolomite output in 1966. Most of this was produced at Mount Burnett, near the north end of South Island.

Fertilizer Materials.—Although more than 1 million tons of fertilizer were spread in 1966 by aerial methods to top dress pasture land and an additional 1 million tons were spread by other methods, the New Zealand Department of Agriculture is convinced that more fertilizer will have to be used to reach livestock production targets.

Between 1965 and 1966 the number of fertilizer manufacturing plants in New Zealand increased from 12 to 15.. A 215-ton-per-day contact process sulfuric acid plant for New Zealand Farmers Ltd. in New Plymouth was commissioned in January 1966, and a 300-ton-per-day plant was brought into production later in 1966 by Challenge Phosphate Co. Ltd. at Otahuhu. The Dominion Fertilizer Co. Ltd. of Dunedin has ordered a 250-ton-per-day sulfuric acid plant from Lurgi Gesellschaft für Chemie und Hüttenwesen G.m.b.H.

MINERAL FUELS

Coal.—In 1966 coal production in seven of the nine New Zealand coalfields declined below their 1965 output, and increases at the other fields failed to make

[3] Richie, J. A., and D. R. Gregg. Bentonites of Canterbury. Proceedings of New Zealand Meeting, Eighth Commonwealth Min. and Met. Cong., Wellington, New Zealand, 1965, pp. 1–13, 208.

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up the decline. National production in 1967 continued to decline, presumably as the result of further demand reductions by railways and gasworks and despite increased consumption by the Meremere powerplant. Despite reduced demand for domestic coal, the Auckland Gas Company imported 26,500 tons of Australian coal, in 1966 for gasmaking because coal being offered from West Coast and Waikato mines was not regarded as being suitable. However, the Mines Department reportedly feels that the problem stems from the design of the gas plant rather than from the qualities of the domestic coal.

The trend toward decreasing numbers of coal mines was continued in 1966 as two more were closed. Of the 125 mines operating in 1966, 90 Government-owned mines (including owned jointly with private interests), with 2,550 employees (76 percent of total employment), accounted for 64 percent of national output. The loss in operation of Government-owned coal mines in 1966 amounted to $2.08 million compared with $2.63 million in 1965.

Although total coal output declined in 1966, strip mines registered a production increase to 1,106,000 tons from 1,066,000 tons in 1965, while reducing employment from 405 to 396. Underground mines producing 1,530,000 tons accounted for 58 percent of total output in 1966 compared with 61 percent in 1965, and employed 2,963 persons, 79 less than in 1965. Coal output by field was as follows, in thousand metric tons:

Field	1965	1966
Waikato and Taranaki	1,369	1,350
Southland	392	392
Grey	416	380
Buller	266	262
Otago	129	125
Reefton	99	99
Other	30	28
Total	2,701	2,636

An explosion on January 19, 1967 at the Strongman state coal mine at Greymouth on the West Coast resulted in the death of 19 miners and significantly curtailed 1967 output at this mine (output up to 660 tons per day). All West Coast mines are gaseous and the three main Greymouth mines are most hazardous. Because of the production break, New Zealand may have been forced to import a limited amount of coal from Australia.

New Zealand coal reserves were estimated in 1964 in millions of recoverable metric tons:

	Measured	Indicated	Inferred
Bituminous	28.0	26.6	79.7
Subbituminous	52.0	152.7	297.0
Lignite	16.9	42.8	387.0
Total	96.9	222.1	763.7

On the basis of a proposal by the Mineral Resources Committee, the Government and the coal industry formed a Coal Research Association to perform work heretofore done by the Coal Advisory Service Association, the Mines Department, and the Chemical Division of DSIR. Efforts will be made to develop new markets and to increase efficiency of coal-fired appliances and coal handling equipment. Some categories of research to be handled by the Association are reducing costs in mining and processing, improving quality of coal, servicing markets, and public relations.

Negotiations between the New Zealand Government and Sumitomo Steel Company and Nippon Kokan complex regarding a possible contract for coking coal exports from Westport to Japan were terminated in late 1966 when it was decided that because of the limited supply of this high-quality coal it should be retained for future New Zealand metallurgical industries.

Petroleum and Natural Gas.—The four well Moturoa field of Egmont Oil Wells Ltd. at New Plymouth remained New Zealand's only crude oil producer. This field's output is processed by a small refinery in New Plymouth to supply gasoline for local consumption. The field also produced natural gas, all of which was supplied to a local company, the New Zealand Gasworks.

After 4 years of indecision, the Government of New Zealand in 1967 made decisions concerning the use and price of natural gas from the Shell-BP-Todd group's Kapuni field (Taranaki, North Island). On the advice of Zinder International (a U.S. consulting firm), the Government decided to put gas into homes and industry by late 1969 by building trunk pipelines to Auckland and Welling-

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ton. Smaller communities along the way will also obtain gas through spur lines. A public corporation will be set up to purchase gas and build a plant to remove carbon dioxide (which constitutes 44 percent of the gas) and other impurities. Daily production will be about 35 million cubic feet. About 3,000 barrels per day of 43° API gravity condensate stripped from the gas will be retained by producers and pumped via a 53-kilometer, 6-inch pipeline to Port Taranaki for shipment by tanker to Whangarei for refining. As an incentive to further exploration, the Government plans to pay a premium of 75 cents per barrel for condensate delivered to Whangarei.

By virtue of Kapuni's estimated 25-year life, the delivered price of the gas (71 cents per thousand cubic feet) will permit recovery of the capital investment. Use of Kapuni gas and condensate is expected to effect a $2.8 million or more savings in foreign exchange.

The New Zealand Refinery Co. Ltd. at Marsden Point, Whangarei produced about 2.2 million tons of refinery products annually in 1966 and 1967, or about 78 percent of national requirements. In 1966 the refinery was credited with a savings of some $12.5 million in overseas exchange.

In 1967 New Zealand supplied international bunkers with 58,776 barrels of aviation gasoline, 597,809 barrels of jet fuel, 512,000 barrels of distillate fuel oil, and 1,357,000 barrels of residual fuel oil. Of the total supplied to bunkers, about 12 percent was used for U.S. Antarctic and Navy operations.

Although exploratory drilling activity was quite modest in 1966, other exploratory activity continued at a relatively high level. Geophysical surveys, especially at sea, together with onshore geological field work was undertaken in connection with exploration of Continental Shelf concession areas.

Only two exploratory holes and one stratigraphic test hole were drilled in 1966; drilling totaled only 5,683 feet. Plans for drilling in 1967 included a 2,300-foot test well by the Australian Oil Corp. on a concession 140 kilometers north of Christchurch, South Island, and a second hole by the New Zealand Aquitaine Petroleum Ltd. (of the BP-Shell-Aquitaine-Todd consortium) in the Waikokopu Valley near Wairoa on the east side of North Island. Offshore drilling was also expected to begin in 1967.

The entire continental shelf was opened to oil search in 1964 with passage of the Continental Shelf Act. Late in 1965, five prospecting licenses were granted covering 49,560 square miles of shelf between the 3-mile limit and the 100-fathom mark to Shell-BP-Todd Oil Services, BP-Shell-Todd Petroleum Development, Tasman Petroleum, Ltd., J. H. Whitney and Co., and Mississippi Oil New Zealand Exploration Co. Ltd. Late in 1966, Esso Exploration and Production New Zealand Inc., a local subsidiary of Standard Oil of New Jersey, obtained a license for 11,400 square miles of shelf area. Esso started aeromagnetic surveys immediately in their eight license areas off the northern tip of the North Island and off the west coast of the South Island. A relative newcomer to the islands is France's Société Nationàlé des Pétroles d'Aquitaine (SNPA) which has joined the Shell-BP-Todd combine. Since 1964 the New Zealand subsidiary of SNPA has been earning a 25-percent interest in the east coast, North Island offshore licenses of the BP-Shell-Todd Petroleum Development as a result of its aid in onshore search. SNPA carried out extensive seismic exploration in 1966 and reportedly planned to drill a test well in Waikokopu Valley in 1967.

Out of a current total of 21 license holders, the major operators exploring the country have been Shell and British Petroleum along with Todd Oil Services Ltd. J.H. Whitney and Co. transferred its prospecting licenses for areas north and south of Taranaki to the New Zealand Offshore Petroleum Co. in which Esso Exploration has a 50-percent interest. Tasman Petroleum Ltd., a joint venture of Geosurveys of Australia Ltd. and Lime and Marble Ltd. of New Zealand, held offshore acreage just south of the Shell group's Taranaki holdings. The Tasman Petroleum Ltd. area was surveyed by aeromagnetic and marine seismic methods beginning in 1965; results indicate a number of promising major uplifts on the sea floor in Golden Bay, Tasman Bay, and the surrounding shelf. Additional seismic surveys of 1,000 line miles were to start in 1967 along the shelf of the South Taranaki Basin. Tasman has signed a farmout agreement with SNPA involving eight of its 11 license areas.

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Plans of Esso Exploration for 1967 were to continue geophysical surveys of the offshore areas around Taranaki using seismic methods. Similarly, the Shell-BP-Aquitaine-Todd consortium was to continue seismic surveys in 1967 off Gisborne, Mahia Peninsula and Hawkes Bay of the North Island and off Canterbury of the South Island.

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The Mineral Industry of Nigeria

By John R. Lewis [1]

Nigeria, with a population in 1967 of around 50 million, was one of Africa's most densely settled nations, with about 150 persons per square mile. The gross national product (GNP) stood at $125 per person.[2] About 21 million workers were in Nigeria's labor force in 1966, 80 percent of whom were in agriculture and fishing. About 10 percent of the workers were employed in the minerals industry.

Since its first production in 1958, petroleum has rapidly become a major export commodity, which helped to bring about a positive balance of trade for Nigeria until the civil war of mid-1967. Nigeria ranked seventh in world tin metal output and is a leading producer of columbite. Other important minerals are coal, gold, iron, lead, zinc, and limestone.

Development of Nigeria's mineral resources became progressively more encumbered as the intertribal disturbances began in the north in 1966 and escalated into declared secession and then a civil war in 1967. Secession of the Eastern Region, where three-fourths of Nigeria's petroleum reserves are located, and a military blockade immediately manifested themselves in a severe crude petroleum shortage for Nigeria as production fell to 10 percent of the prewar output. Tin production, however, continued to rise because operations were located outside the battle sites. Disruption and dislocation troubled the whole minerals sector, reducing mineral output and worsening overall balance of payment levels.

PRODUCTION

Because of the civil war, which began near midyear 1967, data on mineral production from the seceded area are not available. Because of the blockade, exports from the Eastern Region were terminated and the economy there began to return to more primitive levels. Commodities most affected were cement, coal, lead, limestone, and petroleum. By December 1967,[3] daily output of crude petroleum for all of Nigeria was 57,871 barrels, almost 90 percent below what it was in December 1966. Cumulative 1967 output of each of the major mineral commodities was lower in 1967 than in 1966. It is known that no significant amount of petroleum was produced from the Eastern Region from June to December 1967. The Nigerian Coal Co. mines near Enugu were recaptured by Federal forces in October 1967 but were not operated during the balance of the year.

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[1] Petroleum engineer, Division of International Activities.

[2] US Agency for International Development. Economic Data, Selected Annual Trends. July 1968, p. 5.

[3] The Eastern Region (Republic of Biafra) is not included in this analysis.

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Table 1.—Nigeria: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity [2]	1963	1964	1965	1966	1967
Metals:					
Columbite, concentrate	2,044	2,377	2,589	2,262	1,955
Gold, troy ounces	316	244	80	61	39
Lead:					
Concentrate, gross weight	------	--------	931	2,102	r2,000
Lead content	------	--------	r 700	e 1,600	r 1,500
Monazite, concentrate	12	10	8	7	114
Tantalite, concentrate, kilograms	15,240	10,160	13,168	12,192	19,304
Tin (cassiterite):					
Concentrate, gross weight, long tons	11,788	11,787	12,885	12,640	12,620
Tin content, do	8,723	8,721	9,547	9,354	9,340
Metal, unwrought, do	9,051	8,749	9,321	9,869	9,104
Zircon, concentrate	804	r 155	--------	NA	NA
Nonmetals:					
Cement, thousand tons	526	663	983	1,002	784
Clay, kaolin	15,000	3,000	26,000	20,000	325
Limestone, thousand tons	770	996	1,312	1,098	847
Marble	------	--------	1,137	1,520	1,281
Salt	280	557	904	NA	NA
Mineral fuels:					
Coal, thousand tons	577	699	740	640	[3] 95
Gas, natural:					
Gross, million cubic feet	22,106	36,333	79,438	102,677	e 91,531
Marketed, do	NA	2,800	3,395	NA	NA
Petroleum:					
Crude, thousand 42-gallon barrels	27,913	43,997	99,354	152,428	116,519
Refinery products:					
Gasoline, motor, do	------	--------	284	154	e 1,373
Kerosine, do	------	--------	187	102	e 966
Distillate fuel oil, do	------	--------	341	142	e1,460
Residual fuel oil, do	------	--------	467	194	e 1,880
Liquefied petroleum gas, do	------	--------	--------	--------	e 34
Total, do	------	--------	1,279	592	e 5,713

e Estimate. r Revised. NA Not available.

[1] Except for petroleum, data does not include mineral commodity production from Nigeria's former Eastern Region (Republic of Biafra) for the last half of 1967.

[2] In addition to commodities listed, small tonnages of zinc concentrates and of tungsten and molybdenum ores were produced but exact output data are not available.

[3] Source: World Mining. V. 4, No. 7, June 28, 1968, p. 80.

TRADE

Total trade and foreign exchange reserves showed the scars of the civil war. In 1965, according to U.S. Embassy sources, total trade resulted in a net deficit of $21 million.[4]

The improved trade balance of 1966 was attributed chiefly to large increases in exports of crude petroleum and to decreases in imports of certain manufactured goods including petroleum products. This latter was made possible by the inauguration in 1965 of the Port Harcourt refinery, Nigeria's first. Petroleum's burgeoning production accounted for 33 percent of total Nigerian exports in 1966 while tin contributed about 5 percent.

The relationship between Nigerian mineral trade and total trade is shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	r [1] 238	751	31.7
1966	[2] 311	793	39.2
1967	NA	[3] 680	XX
Imports:			
1965	134	772	17.4
1966	[2] 90	718	12.5
1967	NA	626	XX
Trade balance:			
1965	+104	−21	XX
1966	+221	+75	XX
1967	NA	+54	XX

r Revised. NA Not available. XX Not applicable.

[1] Annual Economic Review of Nigeria, June 1967, by Standard Bank Group.

[2] From Nigeria Trade Summary, Federal Office of Statistics, Lagos, Nigeria.

[3] Furnished from selected material from U.S. Embassy, Lagos.

Source: Unless otherwise noted, source is U.S. Agency for International Development. Economic Data, March 1968.

[4] Where necessary, values have been converted from Nigerian pounds (N£) to U.S. dollars at the rate of N£1=US $2.80.

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Table 2.—Nigeria: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum bauxite	49	NA	
Copper, ore, concentrate and matte	49	NA	
Iron and steel:			
Scrap	6,208	9,672	Italy 4,760; Portugal 2,235; Spain 1,301.
Semimanufactures	5	230	United States 199; Togo 30.
Lead ore and concentrate	1,575	1,303	Netherlands 945; West Germany 305.
Nickel:			
Ore and concentrate	------	907	All to France.
Alloys, unwrought	------	5	All to United States.
Tin:			
Ore and concentrate—long tons	9	634	Netherlands 500; Switzerland 130.
Metal and alloys, unwrought—do	10,575	11,495	United Kingdom 7,945; Netherlands 1,980; United States 560.
Zinc:			
Ore and concentrate	1,905	1,525	Netherlands 1,208; Belgium-Luxembourg 317.
Metal and alloys, worked	13	NA	
Other nonferrous ores and concentrates	3,675	[1] 2,566	United States 1,215; United Kingdom 709; Netherlands 482.
Scrap, nonferrous	2,858	3,785	Italy 1,529; West Germany 748; Netherlands 492.
Nonmetals:			
Cement	191	NA	
Construction materials:			
Stone, sand and gravel	1,585	NA	
Other	NA	321	Liberia 179; Ghana 141.
Fertilizer materials, natural	263	849	Ghana 496; Ivory Coast 121; Togo 93.
Salt	18	12	Ghana 12.
Other crude minerals	267	84	Cameroon 38; Ivory Coast 30.
Mineral fuels:			
Briquets	20,491	1,748	Ghana 1,748.
Coal	213	244	Niger 203; Dahomey 40.
Coke and semicoke	15,277	11,914	Ghana 11,914.
Petroleum, thousand 42-gallon barrels—crude.	98,656	143,556	United Kingdom 55,870; West Germany 20,296; France 16,832.
Petroleum refinery products:			
Gasoline—do	------	235,516	Togo 120,835; Equatorial Customs Union 45,120; Cameroon 29,458.
Kerosine—do	1,358	37,027	Equatorial Customs Union 17,527; Dahomey 10,381; Niger 5,517.
Jet fuel—do	------	24,792	Equatorial Customs Union 21,943; Ship store 2,650.
Distillate fuel oil—do	------	145,767	Equatorial Customs Union 54,764; Cameroon 24,440; Ship store 19,651.
Residual fuel oil—do	4,276	556,730	United States 144,555; Pakistan 128,183; Japan 121,406; Cameroon 119,596.
Lubricating oil—do	13	7,002	Ghana 4,217; Dahomey 1,574; Gambia, St. Helena 363.
Asphalt—do	60	51,934	Dahomey 50,225; Equatorial Customs Union 976.
Other—do	------	16,423	All to Gambia, St. Helena.
Tar, pitch and other crude chemicals from coal, oil and gas distillation.	------	42	Norway 36; Dahomey 5.

NA Not available.
[1] Includes columbium-tantalum and zirconium ores.

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Table 3.—Nigeria: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys:			
Unwrought	821	4	All from Hong Kong.
Semimanufactures	1,620	1,247	Switzerland 430; United Kingdom 273.
Copper and alloys:			
Unwrought	35	27	United Kingdom 23.
Semimanufactures	1,654	2,697	United Kingdom 1,947; West Germany 335.
Iron and steel:			
Ore and concentrate	9	2	Niger 1; United Kingdom 1.
Pig iron and ferroalloys	1,139	461	United Kingdom 302; Italy 36.
Ingots and other primary forms	1,077	7,056	France 2,824; United Kingdom 1,699; Italy 1,428.
Semimanufactures:			
Bars and rods	60,056	50,218	West Germany 20,908; Belgium-Luxembourg 6,644; United Kingdom 6,191.
Angles, shapes, and sections	27,439	36,712	United Kingdom 14,122; United States 10,337; Belgium-Luxembourg 6,317.
Plates, sheets, hoop and strip	60,971	68,407	Japan 28,406; United Kingdom 14,401; West Germany 8,174.
Rails and accessories	6,678	1,061	United Kingdom 887; Belgium-Luxembourg 111.
Tubes, pipes, and fittings	107,702	108,728	United States 38,664; Italy 23,913; United Kingdom 12,088.
Other	r 652	125	United Kingdom 59; Italy 50.
Total	r 263,498	265,251	
Lead and alloys, ingots and semimanufactures.	527	260	United Kingdom 167; Belgium-Luxembourg 45; United States 30.
Nickel and alloys, semimanufactures	417	136	United Kingdom 77; Italy 40.
Platinum-group metals, troy ounces unworked.	9,976	37,209	Netherlands 20,812; United Kingdom 11,268.
Silver unworked do	20,702	47,250	United Kingdom 43,474; West Germany 2,565.
Tin and alloys, ingots and semimanufactures. long tons	140	641	United Kingdom 607.
Zinc and alloys, ingots and semimanufactures.	1,979	860	Japan 512; Congo (Kinshasa) 294.
Metals not elsewhere specified:			
Ores and concentrates:			
Other	120	402	United Kingdom 193; West Germany 192.
Oxides, mainly for paint	169	589	United Kingdom 537.
Scrap, nonferrous	1,283	553	Norway 289; Canada 120.
Nonferrous base metals	29	23	West Germany 11; United Kingdom 4; United States 3.
Nonmetals:			
Abrasives, natural	121	339	United States 119; Netherlands 81; United Kingdom 60.
Asbestos, crude and partly worked	3,804	4,594	Canada 2,053; Botswana, Lesotho and Swaziland 1,031.
Cement thousand tons	174	161	Norway 85; West Germany 23; Italy 21; United Kingdom 14.
Clay construction materials do	7	14	United Kingdom 5; Italy 3; United States 1.
Fertilizer materials:			
Crude, all types	1,216	1,401	United States 815; West Germany 154; Belgium-Luxembourg 146.
Manufactured:			
Nitrogenous	14,835	11,124	Belgium-Luxembourg 5,239; West Germany 2,141; United Kingdom 1,906.
Phosphatic	10,660	16,280	United Kingdom 7,788; Portugal 4,320; Netherlands 1,771.
Potassic	3,274	1,756	East Germany 1,195; West Germany 380.
Mixed	6,699	1,347	West Germany 1,120.
Ammonia	365	251	United Kingdom 125; Netherlands 54; Belgium-Luxembourg 27.
Lime	5,427	9,541	United Kingdom 6,911; Bulgaria 2,376.
Mica, crude and partly worked	253	5	All from United Kingdom.
Salt thousand tons	130	126	United Kingdom 89; West Germany 14; Poland 11.

See footnotes at end of table.

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Table 3.—Nigeria: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Sodium and potassium compounds, n.e.s. including caustic soda.	8,996	10,572	United Kingdom 4,563; Netherlands 2,693; West Germany 1,507.
Stone, sand and gravel:			
Dimension thousand tons stone, worked.	5	5	Italy 5.
Crushed rock, sand and do gravel.	38	39	France 35; Italy 3.
Grinding stones and wheels	295	206	United Kingdom 142; Italy 25.
Sulfur in all forms	193	75	United Kingdom 35; West Germany 23; Belgium-Luxembourg 17.
Nonmetals, n.e.s. thousand tons	37	2	Greece 1; Norway 1.
Mineral fuels:			
Coal, coke and briquets	2,660	12,291	Undisclosed 8,268; United Kingdom 3,962.
Petroleum, crude	213	----	
Petroleum refinery products:			
Gasoline. thousand 42-gallon barrels	2,684	129	Netherlands Antilles 71; Italy 23; Iran 20.
Kerosine do	1,110	226	Iran 197; Netherlands Antilles 21.
Jet fuel do	534	22	Sterling Area Western Hemisphere 17; Netherlands Antilles 5.
Distillate fuel oil do	2,658	128	Italy 25; Sterling Area Western Hemisphere 24; Venezuela 23; Iran 22.
Residual fuel oil do	1,725	19	Netherlands 14; West Germany 2; Sweden 1.
Lubricants do	r 242	262	United Kingdom 129; United States 48; Netherlands Antilles 25.
Asphalt and bitumen do	173	49	Venezuela 32; Netherlands Antilles 8; Netherlands 6.
Other do	6	5	United Kingdom 2; France 2; Sweden 1.
Tar, pitch, and other crude chemicals from coal, oil and gas distillation.	1,344	860	United Kingdom 841; United States 11.

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COMMODITY REVIEW

METALS

Aluminum.—Nigeria imports most of her aluminum requirements as semimanufactures. Value of all aluminum imported in 1966 was $1,146,350. The volume imported and fabricated has decreased about 50 percent per year since 1964. Because the war has denied access to the rolling mill at Port Harcourt, which produced aluminum coil from ingots imported from Canada, and because available transportation has been needed for other items, the once growing aluminum industry appeared to be at a low ebb in 1966–67. The only exception was the completion and operation of the Flag Aluminum Products, Ltd. plant at Kaduna which produces long-span aluminum corrugated roofing and accessories in a joint venture with Northern Nigeria Investments, Ltd.

Columbite-Tantalite.—Columbite and some tantalite ore are produced in Nigeria in association with tin ores.

Production of Nigerian columbite declined from a 1965 high of 2,589 metric tons to 1,955 tons in 1967. Prices also fell during 1967, from $22.40 per 22.4-pound "unit" early in the year to about $16.80 per unit at yearend. Mining firms in Nigeria that are solely dependent upon sales of columbite were anticipating difficulties in continuing to operate in 1967. Shipment of columbium-tantalum concentrates were also disrupted by the civil war.

Tantalite production, while very small, was stepped up considerably in 1967. A total of 12 tons, valued at $2,800 per ton, was produced in 1966, and 19 tons, valued at from $5,600 to $8,400 per ton, were produced in 1967.[5] Most of Nigeria's tantalum comes from three very small

[5] World Mining, V. 4, No. 7, June 28, 1968, p. 80.

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mines in the Northern Region or from the slag of the Makeri Tin Smelter. Prices fluctuate widely and there is little interest in an expansion program. The United States and United Kingdom consume all that Nigeria produces.

Iron and Steel.—In spite of the unsettled situation, development of an integrated iron and steel project had high priority in 1967. An agreement between the Government and a consortium of British, other European, and U.S. companies was signed in 1965 to develop pig iron and crude steel facilities inland near raw materials and a steel casting and rolling mill on the Niger River some 125 miles from the coast. The consortium chose not to start work by the end of the agreement period and requested an extension to late 1968.

Early in 1967, in cooperation with the Federal Military Government, a Soviet iron and steel survey team visited all four of Nigeria's regions and studied possible iron and steel development. It was reported subsequently that the country can produce steel at prices competitive with any European country. A U.N. report was said to confirm these facts.

Nigeria hoped to have an estimated annual capacity of 600,000 tons by 1974–75. All of West Africa could thus be furnished with steel, with Nigeria itself using over half. Earlier, West Africa needs had been estimated at around 250,000 tons.

Elsewhere, the war caused closure of Nigeria's galvanized corrugated sheet metal industry which used raw steel sheets from Japan. The galvanizing firms were owned jointly by Japanese and Nigerians.

Lead and Zinc.—The Enyigba-Abakaliki lead and zinc mine in Eastern Nigeria was scheduled to go into full production by the end of 1966. Concentrator capacity was 500 tons per day and Metallgesellschaft A.G. of Frankfort, West Germany, had agreed to buy the relatively small output for 10 years. Because of the Eastern Region breakaway and the consequent blockade by Federal forces, it is unlikely that lead-zinc operations were possible in the second half of 1967. First-half production data can only be estimated.

Tin.—Tin ore (cassiterite) was mined from open pits in the Jos Plateau area of the Northern Region. It was in this sector that intertribal hostilities first began in 1966. The disruptive events caused relocation of tin transportation patterns as well as of work forces. This, in turn, brought some parallel reduction in tin output, but by the end of 1967, production was returning to a normal rate of about 825 long tons of concentrate per month.

The Makeri Smelting Co., Ltd., at Jos is owned by a consortium of British interests and is Nigeria's only tin smelter. Nearly all of Nigeria's tin is smelted here before being exported as ingots. The dislocation of personnel hampered operation of the mines and had a temporary effect on the smelter. Adjustment was ultimately accomplished and in December 1967, the smelter's output was at an alltime high of 1,427 long tons of tin metal.

Nigeria ranked seventh among world smelter tin producers in 1967, with an output of 9,104 long tons. This was nearly 8 percent lower than the 9,869 long tons produced in 1966. The United Kingdom continued to buy three times as much tin metal from Nigeria as the next two big consuming nations, the Netherlands and West Germany, combined.

The value of all tin (metals, ores, and concentrates) exported by Nigeria in 1966 was $43,304,770.

The world price for tin in 1966 was about $3,692 per long ton. By late 1967, the price had fallen to $3,220, a drop blamed on world overproduction. The pound sterling was devalued in November 1967, but Nigeria did not follow suit, and the Government imposed a "super" tax of 10 percent on gross profits which was made retroactive to 1966 incomes, further hurting the tin industry. The value of 1966 tin production was $39,258,000, and in 1967 it declined to $30,780,400.[6] The lower price obtained for tin resulted in representatives of the industry urging the Government to reduce the royalty rates. Reductions were still under consideration at the end of 1967. Some Nigerian tin mines were reported to be operating at a loss in late 1967, and a limited amount of closedown appeared imminent unless remedies could be found.[7]

[6] World Mining, V. 4, No. 7, June 28, 1968, p. 80.

[7] The Nigerian Review, Nigeria's Review of Industry, Commerce and Finance. "Chamber of Mines Boss Sees Bad Future for Tin." Overseas Publishing Ltd., London., March-April 1968, pp. 33–34.

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NONMETALS

Cement.—In May 1967, the Sokoto Province plant of the Cement Company of Northern Nigeria, a joint venture of the Northern Region Government and German interests, began shakedown runs. The $10 million plant, the first in the Northern Region and fourth in the country, had a single kiln with an annual rated capacity of 100,000 tons and employed 170 workers. Good limestone deposits in the area made the plant feasible although it is remote from better markets. Disruption of transportation due to the civil war made competitive delivery of cement from this plant easier than might otherwise be the case if coastal cement plants had easy access to northern markets.

Another new cement plant, costing more than $11 million, went into production at Calabar in the Eastern Region in February 1967. The factory was planned initially to produce 100,000 tons of portland cement per year. Since secession, no information has been available as to its status.

Fertilizers.—Agriculture, the largest sector of Nigeria's economy, requires crude and manufactured fertilizers valued at more than $2 million annually, all of which were imported in 1966, mostly from Western Europe. Demand in the Northern Region, for instance, had exceeded all expectation. Use of such volumes of fertilizer attracted the interest of fertilizer and petrochemical producers in early 1967, and the indigenous manufacture and/or blending of phosphatic and nitrogenous fertilizers appears most promising. One plant, capable of a balanced line of fertilizers, was felt to be ample.

MINERAL FUELS

Oil production, begun in 1958, accounted for 33 percent of all 1966 exports. Nigeria's first refinery, which was able to handle all of Nigeria's petroleum product needs and those of some neighboring countries as well, started operation in 1965. Natural gas exists in large quantity but most of it is flared for lack of market. Coal is normally mined near Enugu for use in electric power generation and on the railroads. All mineral fuel output suffered curtailment when the civil war began.

Coal.—All coal production in Nigeria is by the Nigerian Coal Corp., a federal statutory body. Until unrest began in 1966, mines near Enugu were the sole source. The uprisings in the North in 1966 and the subsequent closing of the eastern line of the railway already had disrupted coal distribution before civil war broke out. Shipments in 1966 were forced to travel south by rail to Port Harcourt, thence west by water to Lagos, and then northward to all interior points via rail. Principal 1966 consumers were the Nigerian Railway Corp. (2,000 tons per week) for steam locomotives, the Electricity Corp. of Nigeria (1,000 tons per week) for generating steam for electric power stations at Lagos and Kano, and the Nkalagu Cement Plant near Enugu.

Nigerian coal production in 1966 was 640,000 tons, all from the Enugu mines. Only 15 percent of this amount was produced in 1967 when 95,000 tons were mined. Coal imports rose very rapidly in 1966–67 to cover the shortage caused by the passing of the Enugu mines into the hands of the secessionists who did not operate the mines.

The Government of Nigeria's Northern Region began to develop the Okaba mine about 65 miles north of Enugu in 1967, apparently on an extension of the Enugu seam. It was expected to be operating in 1968, providing between 400 and 450 tons daily.

Partial dieselization of motive power, marked traffic reductions on the Nigerian Railway, and loss of some consumers to Biafra have cushioned the demand for coal in recent years.

Petroleum.—When peace returns, Nigeria is generally expected to become one of the larger petroleum-producing nations. Production cutbacks due to the civil war eliminated Nigeria as a possible substitute source of crude for buyers who found themselves cut off from Middle East sources by the crisis there. By the end of 1967, only a small comeback had been possible for Nigerian crude oil production.

When the civil war gained momentum in mid-1967, crude production fell to 10 percent of prehostility levels because three-fourths of the crude reserves were in territory claimed by the secessionists. All that remained usable was some 55,000 barrels daily from offshore or from fields in the Mid-west Region. Tankers could no longer service Port Harcourt, the only major crude exporting terminal, because

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it was blockaded. Company personnel were evacuated from the Eastern Region. Although the new Port Harcourt refinery was seized by the secessionists and may have been operated for a short period, it was ineffectual for the Eastern Region. A product shortage ensued, and once again Nigeria was forced to import petroleum products.

A vigorous offshore development went forward despite the war and there were prospects that by 1968 or 1969, even if the war continues, the active onshore-offshore development in Federal Nigeria will enable her again to export more oil as crude than she must import as products. Once the refinery can be reactivated, the situation will improve further and the current drain on foreign exchange will be reversed. Most oil companies concerned were waiting to move back in and rehabilitate their holdings, but it was estimated that this would take up to a year to complete.

Exploration and Development.—In May 1966, a pair of two company partnerships and six individual firms were prospecting for oil, both onshore and offshore, in Nigeria.

There was no onshore exploration or development in the Eastern Region after June 1967. Mobil Oil continued drilling operations offshore of the Eastern Region by operating out of the nearby Spanish island of Fernando Po. Offshore operations of Shell-British Petroleum and American Overseas were suspended in the early part of the crisis and had not been resumed at yearend. Meanwhile, exploratory operations in Federally held onshore and offshore areas were at a low ebb but continued to varying degrees throughout the year. Drilling rig activity, which had used 28 rigs in May 1967 before hostilities began, fell to two in August but was back up to around 10 by yearend.

Production.—The fast-rising tide of Nigerian crude oil production, which had been expected to be 600,000 to 630,000 barrels per day by yearend 1967 and 1 million barrels per day by 1970, was abruptly halted at midyear by the war. The country had ranked 12th among world crude producers and was third in Africa in 1966. About three-fourths of Nigeria's crude production in 1967 lay within the somewhat fluid boundaries of the seceded and blockaded areas of the Eastern Region. The Nigerian Federal Government stopped all tanker movements to the Biafran oil port of Bonny shortly after the breakaway, cutting off outward flow of crude. At the close of 1967, therefore, daily crude production was only a trickle.

Prior to hostilities, the dominant factor in Nigeria's oil production was a joint partnership between Shell and British Petroleum. These operations were onshore and mostly in the Eastern Region, hence were curtailed by the war. A small producing operation of Société Anonyme Française de Recherches et d'Exploitation Petrolières (Nigeria) Ltd. (SAFRAP) was also shut down about the same time. Nigerian Gulf Oil Co., Ltd., was working offshore or in the Mid-west Region and was not seriously disrupted. By early 1967 the Caltex group (Standard Oil Co. of California and Texaco Inc.) had begun to produce from the Pennington field offshore the mouth of the Bonny River. Also about the same time, Phillips Petroleum Co. and the Italian Government-owned Ente Nazionale Idrocarburi (ENI) had more than 11 wells in the Eboka and M'Bede fields ready to deliver through a 44-mile, 14-inch pipeline being built for them to join another line to the coast.

Refining.—The almost new Port Harcourt refinery of the Nigerian Petroleum Refining Co., Ltd., with a crude throughput capacity of about 43,000 barrels daily, together with associated projects including a new $2.1 million tanker-loading jetty, loading facilities for road and rail, and other units, fell into the hands of the secessionists toward the end of July 1967. Neither the extent of use by this group nor the extent of such sabotage as the refinery may have sustained was evident at yearend 1967, although it was conceded that both had occurred.

Transportation.—Until the war, crude petroleum produced in Nigeria was primarily transported either to the Port Harcourt refinery or to the Bonny River terminal through an extensive system of pipelines which was under constant expansion. When the shutdown came, the system was about at capacity. By summer 1967, Nigerian Gulf had set up a temporary terminal some 110 miles along the coastline from the Bonny terminal. A new permanent installation at the mouth of the Escravos River was expected to be com-

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pleted before mid-1968. Pipelines were under construction to service the facility. When completed, the terminal would be capable of handling up to 135,000 barrels of export crude per day, loaded via offshore buoy facilities. Shell-British Petroleum had under consideration another similar pipeline to move crude to a sizable new export terminal to be built, possibly offshore from the Midwest Region.

Much of Nigeria's crude is hauled by oceangoing tanker to Britain. In the first 4 months of 1967, about 9.5 percent of all Britain's crude requirements were thus furnished. The Federal blockade of the Bonny terminal, effective around June 1, 1967, cut off all of this traffic and none had been reinstated by yearend.

Distribution and Marketing.—On July 13, 1967 the Government assumed wide powers over petroleum transportation, storage, and distribution and the facilities used in connection therewith. Stating that the decree was precautionary to insure availability of petroleum products or crude if needed throughout the country, it also indicated that, while not necessary at the moment, the decree also provided for regulations for the rationing of petroleum should this become necessary.

Natural Gas.—Natural gas production in Nigeria during 1966–67 was far more than could be used by consumers and 93 to 94 percent was flared. (Under these conditons, it is usually economical to use natural gas as a raw material for petrochemicals, fertilizers, and liquefied petroleum gas—all primarily for export.) In earlier years, plans for several gas liquefaction and exporting plants had been discussed and operations were under negotiation; however, exported liquefied petroleum gas (LGP) will be forced to compete with North African LPG for the booming European market.

Total gas produced in 1966 amounted to 102,677 million cubic feet, of which 6 percent was sold. In 1967, total gas produced reflected the drop in oil production when 91,531 million cubic feet were produced. Increased sales, 6,406 million cubic feet, made the percentage actually used climb slightly to 7 percent. The ratio of cubic feet of gas produced per barrel of oil averaged 1,200 in April 1967.[8]

[8] Monthly and Annual Petroleum Information Reports of the Petroleum Division, Ministry of Mines and Power, Government of Nigeria, Lagos.

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The Mineral Industry of Norway

By F. L. Klinger [1]

The Norwegian mineral industry had a productive year in 1967. Output of iron ore, ferroalloys, aluminum, magnesium, iron and steel, ilmenite, cement, and petroleum products was at record levels, while declines in output of nickel, refined copper, and cobalt appeared to be temporary. Important expansions of productive facilities, most of which were scheduled to be operational in 1968, were underway in the mining and mineral processing industries. New investment in the mining and primary metals industries was substantially higher than in 1966, but declined in the nonmetallic-mineral and fuels-processing sectors. Activity in the construction industry appeared to be the highest in several years. Oil and gas exploration in Norwegian areas of the North Sea continued strong, although no commercial discoveries were reported. The mineral industry continued to account for about 4.5 percent of the gross national product, which was estimated at $9,260 million in 1967.

Declines in exports of aluminum and fertilizer materials and declining prices for ferroalloys made prospects for continued growth in 1968 somewhat uncertain. The rate of investment was expected to decline since most expansion projects were nearing completion, and the Government continued to check internal demand by a policy of high taxation and tight credit. It was also reported that average unit costs of Norwegian industrial production had increased by 10 to 11 percent since 1965, compared with only 5 to 8 percent in other West European countries.

Devaluation of the British pound late in the year added another uncertain factor to the outlook for 1968. The United Kingdom is the largest market for several of Norway's major export commodities, including aluminum, ferroalloys, iron and steel, and feldspar.

Cheap hydroelectric power continued to be a major advantage for Norwegian industry. In 1967 the country's approximately 550 hydroelectric power stations produced a record 52-billion kilowatt-hours of electricity valued at about $300 million.

[1] Physical scientist, Division of International Activities.

Employment and the value of production for different sectors of the mineral industry in 1966 follow:

Activity	Number employed	Million dollars	
		Gross value of production	Value added, at f.o.b. establishment prices [1]
Mining and quarrying:			
Coal mines	679	4.81	4.38
Metal mines	4,565	46.74	38.22
Quarries and other	3,195	29.76	26.75
Total	8,439	81.31	69.35
Mineral processing:			
Primary metals	25,154	527.46	194.27
Nonmetallic mineral processing	13,037	133.42	83.00
Coal and petroleum processing	1,200	78.34	11.72
Fertilizer manufacturing	6,258	103.49	56.11
Total	45,649	842.71	345.10
Grand total	54,088	924.02	414.45
Total all industry	383,889	5,220.10	2,166.20

[1] Gross value of production less cost of raw materials.
Source: Statistisk Sentralbyra (Oslo). Industristatistikk (Industrial Statistics) 1966. 1968, pp. 15–17.

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PRODUCTION

The relative volumes of production for different branches of the mineral industry during the past 3 years follow:

	Index number (1961 = 100)		
	1965	1966	1967
Mining and quarrying:			
Coal mines	126	119	119
Metal mines	144	143	178
Mineral quarries	117	125	127
Stone, sand and gravel	150	155	178
Mineral processing:			
Primary metals	141	151	159
Nonmetallic manufactures	125	131	136
Coal and petroleum processing	98	100	106
All mining and quarrying	138	141	166
All industry	127	134	140

Source: Statistisk Sentralbyra (Oslo). Statistisk Manedshefte (Monthly Bulletin of Statistics). No. 2, 1968, pp. 15–16.

In 1967 a large increase in the output of iron ore was responsible for most of the gain shown by the mining sector. Production of titanium, molybdenum, and magnesium ores probably increased, but mine output of copper, lead, zinc, and pyrite declined. Increased output of cement and other construction materials accounted for most of the gains in the nonmetallics sector, although consumption of limestone by the fertilizer industry probably declined. Production of ferroalloys, iron and steel, aluminum, and zinc increased the index for primary metals while output of nickel, refined copper, and cobalt was slightly less than in 1966. The gain in fuels processing was mainly due to increased output of petroleum refinery products.

Table 1.—Norway: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Aluminum:					
Alumina [e]	13,000	14,000	16,000	15,000	15,000
Unwrought:					
Primary	216,100	261,019	r 279,302	r 323,692	362,159
Secondary	3,245	7,376	16,515	11,961	NA
Alloyed	11,651	16,613	14,958	29,300	NA
Superpure [e]	2,700	2,900	2,900	2,900	2,900
Scrap	851	544	601	720	NA
Semimanufactures	r 17,254	r 19,449	r 21,224	25,278	NA
Cadmium	110	r 113	r 130	e 126	e 130
Cobalt	625	568	823	799	e 780
Columbium concentrate (35 to 42 percent columbium)	r 355	185	150	--------	--------
Copper:					
Concentrate (15 to 27 percent copper)	29,499	30,818	31,079	r 30,230	32,567
Metal content	7,354	7,758	r 7,862	r 7,827	7,934
Content of cupriferous pyrite	6,911	7,215	6,905	r 6,988	6,267
Unrefined [1]	r 17,902	r 17,510	r 20,085	r 19,922	19,902
Refined	12,901	12,224	14,762	14,663	14,100
Semimanufactures	13,657	15,074	14,688	13,248	NA
Ashes and residues, value, thousands	$61	NA	NA	$1,235	NA
Iron and steel:					
Iron ore, thousand tons	1,999	2,123	2,464	2,451	3,232
Pig iron, do	407	437	524	630	644
Ferroalloys:					
Ferrosilicon (45-percent basis), do	158	225	278	r 236	281
Other, do	184	232	288	r 273	309
Crude steel, do	542	614	676	r 730	790
Semimanufactures:					
Rolled products, do	456	519	561	592	NA
Wire, uncoated, do	42	42	43	41	NA
Pipe, including cast iron pipe, do	52	55	65	61	NA
Lead:					
Concentrate (51 to 63 percent lead)	5,778	6,968	6,879	r 7,160	6,688
Metal content	2,991	r 3,580	r 3,502	r 3,526	r 3,400
Magnesium, unwrought:					
Unalloyed	18,081	20,935	r 23,904	r 25,795	e 28,500
Alloyed	NA	17,118	18,234	21,225	NA
Metalloids:					
Selenium [e]	15	15	15	15	15
Silicon	NA	NA	10,300	12,890	e 15,000
Molybdenum concentrate	372	405	425	404	e 465
Metal content	r 210	r 228	r 239	227	e 260

See footnotes at end of table.

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Table 1.—Norway: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals—Continued					
Nickel	26,421	30,110	31,835	32,237	28,154
Precious metals, value, thousands	$3,788	NA	NA	NA	NA
Tin, secondary, including alloys and scrap, long tons	455	560	551	536	NA
Titanium:					
Ilmenite concentrate	242,255	272,023	282,150	r 369,726	e 400,000
Dioxide	--------	r NA	r NA	e 8,000	e 12,000
Vanadium, mine e	685	670	680	660	670
Zinc:					
Concentrate (mostly 50 to 55 percent zinc)	25,219	23,865	r 24,948	r 25,933	23,340
Metal content	13,048	12,493	r 12,937	r 13,311	e 12,200
Smelter	46,600	48,357	52,576	r 51,120	54,725
Semimanufactures	4,000	4,463	4,716	5,076	NA
Ashes and residues	327	689	18,952	23,278	NA
Oxides	2,000	1,536	1,135	e 2,000	NA
Other ashes and residues, n.e.s., value, thousands	$836	$1,057	$727	$1,386	NA
Nonmetals:					
Cement, thousand tons	1,438	1,541	1,603	r 1,827	2,066
Dolomite, unground, do	r 186	r 365	227	r 273	NA
Feldspar	r 77,326	r 71,146	r 63,996	88,140	e 85,000
Fertilizer materials:					
Nitrogen, thousand tons	307	355	382	388	370
Superphosphate, do	46	r 43	r 41	r 23	NA
Manufactured fertilizers:					
Nitrogenous, do	1,299	1,422	1,489	1,379	NA
Compound, do	260	427	457	583	NA
Graphite	7,628	7,242	r 8,480	r 7,943	e 8,000
Lime	122,391	115,227	233,994	253,972	e 240,000
Mica (exports)	3,591	3,978	4,116	4,290	e 4,500
Olivine	56,900	r 57,977	r 87,655	r 96,717	e 100,000
Pyrite:					
Cupriferous (40 to 47 percent sulfur)	397,165	410,775	413,704	403,784	NA
Noncupriferous (39 to 51 percent sulfur)	324,281	301,507	295,167	273,714	NA
Total pyrite	721,446	r 712,282	708,871	677,498	633,740
Sulfur content of total pyrite	328,237	321,807	316,689	302,183	e 282,000
Quartz	414,062	450,373	528,977	522,784	e 525,000
Stone, sand and gravel:					
Dimension stone:					
Granite (for sale)	6,422	6,644	r 5,887	5,632	NA
Marble	3,011	1,688	750	2,291	NA
Syenite ("labrador")	33,816	39,728	32,289	45,408	NA
Slate, thousand square meters	294	239	206	382	NA
Worked, all types, value, thousands	$4,307	$5,051	$5,765	$5,809	NA
Limestone, unground, thousand tons	3,760	r 4,091	r 3,667	r 4,088	e 4,000
Nepheline syenite	23,000	r 30,816	r 41,017	r 57,306	e 60,000
Sand and gravel:					
Screened, thousand cubic meters	1,590	1,858	2,632	1,924	NA
Other, including crushed stone, do	3,734	4,287	4,833	6,268	NA
Sulfur, elemental (recovered)	350	--------	--------	--------	--------
Sulfuric acid, 100 percent	r 103,628	r 109,607	124,242	r 139,299	207,328
Talc and soapstone:					
Unground	73,062	79,411	e 80,000	78,350	e 80,000
Other	74,811	76,217	76,982	80,103	80,000
Mineral fuels:					
Coal, thousand tons	382	442	426	r 434	408
Coke: [2]					
Coke-oven, do	--------	108	r 201	230	NA
Gasworks, do	r 49	23	r 23	r 10	NA
Gas (manufactured), thousand cubic meters	34,647	31,641	31,867	33,403	29,176
Petroleum refinery products:[2]					
Motor gasoline, thousand tons	285	368	407	r 348	e 375
Kerosine and jet fuel, do	8	7	10	13	e 115
Distillate fuel oil, do	804	869	1,009	1,052	e 1,050
Residual fuel oil, do	1,280	1,517	1,251	1,348	e 1,380
Liquefied petroleum gas, do	15	18	24	26	NA
Other, do	94	107	96	r 184	e 115
Total refinery products, do	2,486	2,886	2,797	2,971	e 3,035
Total crude oil throughput, do	2,572	3,028	2,889	r 3,073	e 3,130

e Estimate. r Revised figure. NA Not available.

[1] Product of Kristiansand nickel refinery and Sulitjelma copper smelter.

[2] Organization for Economic Cooperation and Development (OECD). Basic Statistics of Energy 1952–1966. Paris, 1968, 287 pp. Organization for Economic Cooperation and Development (OECD). Provisional Oil Statistics, 3rd quarter, 1967. Paris, 1968, 21 pp.

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TRADE

Preliminary data indicated that the value of Norway's mineral commodity trade in 1967 was not appreciably different from that in 1966. Mineral commodities accounted for 32 percent of all export value and 21 percent of all import value. The trade deficit attributable to mineral commodities increased to about $21 million in 1967, compared with a total trade deficit of more than $1,000 million. Increased export of iron ore and ferroalloys was offset by reduced export of fertilizer materials and nonferrous metals, while imports of petroleum and refinery products increased by $18 million. The principal trading partners continued to be the United Kingdom, West Germany, Sweden, and the United States.

The relationships between mineral commodity trade and total Norwegian trade in 1965 and 1966 are shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	488.6	1,442.6	33.8
1966	556.8	1,563.3	35.6
Imports:			
1965	r 527.2	2,205.7	23.9
1966	566.8	2,402.9	23.6
Trade balance:			
1965	r −38.6	−763.1	XX
1966	−10.0	−839.6	XX

r Revised. XX Not applicable.

Source: United Nations Statistical Office, New York.

The following tabulation shows the relative importance of the principal mineral commodities traded in 1965 and 1966:

Commodity	Value (million dollars)		Share of total (percent)	
	1965	1966	1965	1966
Export:				
Nonferrous metals: [1]				
Aluminum	119.7	169.6	24.5	30.5
Nickel	53.3	52.6	10.9	9.5
Magnesium	14.2	16.9	2.9	3.0
Other	r 42.1	55.2	8.6	9.9
Iron and steel:				
Iron ore [2]	11.8	11.8	2.4	2.1
Ferroalloys	61.6	58.6	12.6	10.5
Other [1]	50.2	54.8	10.3	9.8
Fertilizers	65.2	61.0	13.3	11.0
Petroleum products	23.8	21.5	4.9	3.9
Other	46.7	54.8	9.6	9.8
Total	488.6	556.8	100.0	100.0
Import:				
Mineral fuels:				
Solid	21.8	23.9	4.1	4.2
Liquid	140.8	157.5	26.7	27.8
Iron and steel [1]	129.6	134.6	24.7	23.8
Alumina	36.9	41.4	7.0	7.3
Nickel-copper matte	58.7	62.5	11.1	11.0
Nonferrous metals [1]	r 57.6	67.6	10.9	11.9
Other	81.8	79.3	15.5	14.0
Total	527.2	566.8	100.0	100.0

r Revised.
[1] Includes scrap.
[2] Includes roasted pyrite.
Source: United Nations Statistical Office, New York.

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Table 2.—Norway: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:[1]			
Scrap	628	1,850	West Germany 1,111; Denmark 400.
Unwrought	242,550	348,007	United Kingdom 114,746; United States 81,257; West Germany 62,740.
Semimanufactures	5,074	7,668	Sweden 2,618; Denmark 1,300; Finland 847.
Cadmium	99	70	NA.
Cobalt	886	809	NA.
Columbium concentrate	168	-------	
Copper:			
Concentrate	11,548	15,348	West Germany 10,957; Sweden 4,391.
Cuprous oxide	1,589	1,941	NA.
Scrap [1]	2,030	1,914	West Germany 861; Belgium-Luxembourg 498.
Blister	4,909	5,103	West Germany 3,138; Belgium-Luxembourg 1,955.
Refined	15,091	16,955	West Germany 6,597; Switzerland 2,220; United Kingdom 1,690.
Semimanufactures [1]	3,002	5,048	Sweden 2,990; Denmark 515; Israel 503.
Gold:			
Unwrought troy ounces [2] and semimanufactures.	1,254	NA	
Scrap and other kilograms waste.[1]	163	NA	
Iron and steel:			
Iron ore thousand tons	1,374	1,437	West Germany 545; United Kingdom 427; Finland 303.
Roasted pyrite	73,284	67,853	United Kingdom 42,714; West Germany 15,774.
Scrap	11,245	15,006	United States 10,190; West Germany 4,231;
Pig iron [2]	137,966	183,159	United Kingdom 79,077; Italy 34,042. West Germany 20,902.
Ferroalloys:			
Ferromanganese	101,798	114,265	Belgium-Luxembourg 21,520; West Germany 20,066; Italy 13,617; United States 13,600.
Other	396,658	360,964	United Kingdom 116,195; West Germany 104,413; United States 33,547.
Ingots and other primary forms	106,139	112,951	Netherlands 49,057; Denmark 33,718.
Semimanufactures:			
Bars, rods, sections	138,551	178,821	United Kingdom 66,422; Sweden 30,137; West Germany 24,404.
Sheets and plates	64,918	57,276	Sweden 34,109; United Kingdom 11,907.
Hoop and strip	223	261	Sweden 142.
Rails and accessories	2,193	1,188	Sweden 666; Belgium-Luxembourg 396.
Wire	3,180	3,939	Portugal 883; Greece 858; Poland 797.
Tubular products	25,558	22,793	Sweden 8,996; Denmark 2,551; East Germany 1,549.
Castings and forgings	8,799	9,136	Sweden 6,951; Liberia 882.
Total semimanufactures	243,422	273,414	
Lead:			
Concentrate	5,903	7,410	United Kingdom 3,715; Belgium-Luxembourg 2,402; West Germany 1,293.
Scrap	2,945	2,999	Denmark 2,643.
Unwrought [1]	360	586	France 232; Finland 116; Sweden 114.
Semimanufactures [1]	r 279	259	Sweden 241.
Magnesium:			
Scrap	95	61	NA.
Unwrought	24,842	30,366	West Germany 22,584; United Kingdom 2,158; United States 1,454.
Semimanufactures	11	NA	
Manganese ore	8,369	3,048	All to United States.
Molybdenum concentrate	424	433	All to Sweden.
Nickel:			
Scrap	65	132	Sweden 57; West Germany 47.
Unwrought [1]	31,238	30,622	United States 9,760; West Germany 5,163; Sweden 4,982; United Kingdom 4,893.
Semimanufactures	270	219	Italy 75; Sweden 54; Yugoslavia 39.
Selenium value, thousands	$79	$70	Sweden $48; Netherlands $22.
Silicon	8,038	11,310	West Germany 4,083; United Kingdom 4,075; Czechoslovakia 1,458.
Silver and platinum-group metals:			
Silver troy ounces [2]	5,160	NA	
Platinum-group metals do	18,004	14,564	United States 11,767; Netherlands 2,508.
Scrap, residues, etc. kilograms	71,264	39,099	West Germany 22,500; United Kindgom 13,194.

See footnotes at end of table.

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Table 2.—Norway: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Tin:			
Scrap—long tons	r 49	70	Denmark 43; West Germany 23.
Unwrought and semimanufactures.[1] do	r 243	239	Sweden 216.
Titanium (ilmenite concentrate)	324,239	350,045	West Germany, 219,497; Italy 67,883; United Kingdom 60,008.
Zinc:			
Concentrate	22,055	16,150	West Germany 9,967; Poland 6,183.
Oxide	198	223	Sweden 82; Denmark 74.
Scrap	811	618	Netherlands 248; United Kingdom 151.
Unwrought[1]	37,785	40,857	West Germany 11,504; Sweden 11,234; United Kingdom 6,869; United States 3,658.
Semimanufactures[1]	1,471	1,714	Netherlands 368; Sweden 297; West Germany 281.
Other, n.e.s.:			
Ores and concentrates	3	3	All to United States.
Nonferrous ashes and residues[4]	r 24,755	31,000	Sweden 13,199; West Germany 13,152.
Oxides[5]	152	3,872	Sweden 3,336.
Scrap	169	2	West Germany 60.
Chemical elements. value, thousands	$110	$597	NA.
Nonmetals:			
Abrasives, including artificial:			
Grinding stones	1,153	1,213	Poland 288; Sewden 182; Finland 166.
Silicon carbide (carborundum)	27,720	35,634	NA.
Cement	327,150	447,571	United States 179,178; Nigeria 97,833; Ivory Coast 71,202.
Clay construction materials:			
Refractory	11,184	7,667	West Germany 5,992; Sweden 927.
Nonrefractory. value, thousands	$78	$106	United Kindgom $62; Sweden $31.
Dolomite	77,774	84,237	Sweden 21,019; West Germany 15,270; United Kingdom 13,946.
Fertilizer materials:			
Ammonia, anhydrous	33,644	64,592	NA.
Other:			
Nitrogenous. thousand tons	1,438	1,176	Denmark 688; Sweden 456; Spain 85; United States 82.
Phosphatic do	24	6	
Other do	186	297	
Feldspar	90,960	106,649	United Kingdom 42,878; West Germany 17,483; Netherlands 15,584.
Graphite	8,332	8,299	United States 3,261; West Germany 1,880; United Kingdom 1,033.
Lime	r 433	2,470	Sweden 2,370.
Limestone, for industrial use	23,073	22,836	Sweden 17,696.
Mica, crude	4,151	4,290	France 1,255; West Germany 820; Sweden 584.
Pyrite	583,286	554,785	West Germany 421,582; Sweden 85,775; Denmark 44,529.
Quartz	26,463	9,044	United Kingdom 5,658; West Germany 1,465.
Salt	3,958	4,191	Sweden 1,773; Iceland 1,674.
Stone, sand and gravel:			
Dimension stone:			
Granite and gneiss	3,633	4,522	Sweden 1,352; West Germany 773; France 740.
Marble and other calcareous.	1,353	1,084	West Germany 386; Denmark 196; Italy 184.
Syenite ("labrador")	43,842	45,001	France 16,049; West Germany 10,434; Italy 9,157.
Slate	40,671	41,710	Netherlands 19,761; West Germany 5,834; Denmark 5,580; Sweden 4,808.
Worked, all types	770	3,434	Netherlands 1,253; West Germany 766.
Gravel and other crushed stone	334,091	435,806	West Germany 305,670; United Kingdom 72,249.
Sand	1,492	NA	
Sulfur:			
Elemental	1	2,086	United Kingdom 1,970.
Dioxide	2,874	3,291	Sweden 3,156.
Sulfuric acid, including oleum	19,329	18,421	United Kingdom 8,710; Sweden 6,075.
Talc and soapstone	r 69,586	74,802	United Kingdom 21,121; Denmark 11,565; Sweden 9,506; West Germany 9,404.

See footnotes at end of table.

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Table 2.—Norway: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals—Continued			
Other, n.e.s.:			
Mineral materials, including slag.	1,281	3,714	United States 2,198; Netherlands 426.
Caustic soda	6,910	10,447	Denmark 6,096; Sweden 4,351.
Inorganic acids	13,234	12,291	NA.
Hydrogen value, thousands and rare gases.	$342	$288	Sweden $151.
Mineral fuels:			
Asphalt and bitumen, natural	19	926	Sweden 777; Denmark 109.
Coal	137,564	130,002	West Germany 116,914.
Coal tar and other coal derivaties	17,661	21,527	Netherlands 7,684; France 7,640.
Coke	99,610	49,575	Greece 22,072; Venezuela 12,814; Denmark 5,246.
Petroleum refinery products:			
Gasoline	146,503	153,593	All to Sweden.
Kerosine, including white spirit	r 6,050	e 8,516	Do.
Distillate fuel oil	556,497	539,448	Sweden 457,000; West Germany 60,421.
Residual fuel oil	r 513,646	401,773	Sweden 348,591.
Lubricants, including grease	r 21,286	23,363	Sweden 7,998; Denmark 7,240.
Liquefied petroleum gas. value, thousands	$424	$468	United Kindgom $261; Denmark $146.
Bitumen and other	499	279	Sweden 194.

e Estimate. r Revised. NA Not available.
1 Including alloys.
2 Including cast iron, spiegeleisen, and powder.
3 Calculated from quantities reported in kilograms.
4 Not including precious metals.
5 Including strontium, barium, and magnesium.
6 White spirit only.

Table 3.—Norway: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	29,254	32,570	Greece 32,056.
Oxide and hydroxide 1	540,328	614,588	Jamaica 165,712; Surinam 122,509; Guinea 117,336; United States 115,101.
Scrap	NA	580	United Kingdom 408; Sweden 152.
Unwrought 2	9,868	9,194	U.S.S.R. 3,528; Hungary 2,472; United Kingdom 1,610.
Semimanufactures 2	7,038	10,735	Sweden 4,090; United Kingdom 1,932; Belgium-Luxembourg 1,860.
Antimony	102	44	Sweden 10; mainland China 10; Netherlands 9; United Kingdom 9.
Arsenic trioxide	68	70	All from Sweden.
Chromium:			
Ore	76,593	69,890	Turkey 38,563; U.S.S.R. 20,784; Southern Rhodesia 8,053.
Oxides	138	132	West Germany 97; United Kindgom 24.
Cobalt:			
Oxide and hydroxide	2	NA	
Metal, except scrap	12	3	All from Belgium-Luxembourg.
Copper: 3			
Scrap	160	-------	
Unwrought	4,939	5,089	United States 3,655; United Kingdom 972.
Semimanufactures	21,713	23,669	Canada 8,257; Sweden 4,904; United Kingdom 2,200.
Gold: 3			
Unwrought troy ounces	29,771	NA	
Semimanufactures do	11,220		
Iron and steel:			
Iron ore	15,770	8,658	Sweden 8,461.
Slag, dross, etc., from iron and steel manufacture.	35,802	38,303	Sweden 16,385; France 13,503.
Scrap	61,441	39,104	West Germany 14,759; Denmark 12,488; East Germany 7,240.
Pig iron and ferroalloys 4	15,674	19,809	Finland 7,275; Sweden 5,531.
Ingots and other primary forms	82,372	70,154	Netherlands 59,164; Japan 4,447.

See footnotes at end of table.

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Table 3.—Norway: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Iron and steel—Continued			
Semimanufactures:			
Bars, rods, sections	218,856	231,363	France 62,461; West Germany 48,442; Belgium-Luxembourg 44,064.
Plates and sheets	410,653	453,390	United Kingdom 111,444; Sweden 77,301; West Germany 76,135.
Hoop and strip	65,696	64,740	Belgium-Luxembourg 35,875; France 7,958; United Kingdom 6,831.
Rails and accessories	19,972	11,529	Sweden 4,189; United Kingdom 3,851.
Wire	10,524	11,189	Belgium-Luxembourg 5,701; United Kingdom 1,727.
Tubular products	54,929	65,680	West Germany 25,562; Sweden 11,178; United Kingdom 10,756.
Castings and forgings	247	388	United Kingdom 144; Sweden 134.
Total semimanufactures	780,877	838,279	
Iron oxide and hydroxide	1,564	1,572	West Germany 1,334.
Lead: [2]			
Oxides	895	1,139	West Germany 501; United Kingdom 452.
Scrap	154	115	All from Sweden.
Unwrought	9,487	11,387	Peru 3,581; Denmark 2,349; Republic of South Africa 1,904.
Semimanufactures	1,292	1,439	Netherlands 456; Belgium-Luxembourg 396.
Magnesium	143	137	United States 124.
Manganese:			
Ore	510,111	488,562	Ghana 189,288; Brazil 85,552; British Guiana 62,043.
Oxides	229	265	Japan 115; Netherlands 91.
Mercury—76-pound flasks	667	609	United States 493; Sweden 87.
Molybdenum	1	8	United States 4; Austria 3.
Nickel:			
Matte	60,719	61,374	Canada 61,364.
Scrap	2,771	1,875	United States 1,073; United Kingdom 781.
Unwrought [2]	68	188	United Kingdom 165.
Semimanufactures, including anodes. [2]	247	271	United Kingdom 113; West Germany 79.
Silver and platinum-group metals: [3]			
Silver, thousand troy ounces, unwrought or partly worked.	3,616	3,136	United Kingdom 1,740; West Germany 1,295.
Platinum and platinum-group metals, thousand troy ounces	3,408	3,151	United Kingdom 2,090; Belgium-Luxembourg 546.
Sweepings, scrap, residues. [2] kilograms	28	NA	
Tin: [2]			
Scrap, long tons	19	94	Sweden 55; Finland 39.
Unwrought, do.	597	594	United Kingdom 214; Denmark 102; Netherlands 101.
Semimanufactures, do.	296	354	United Kingdom 315.
Titanium:			
Ore	184	286	Australia 256; Italy 10.
Dioxide	9,137	NA	
Tungsten, wire and powder	3	1	Mostly from Netherlands.
Uranium [2] kilograms	71	NA	
Other radioactive material, value, thousand dollars	$299	$418	United Kingdom $347.
Zinc:			
Ore	103,150	87,087	Sweden 63,072; Australia 13,197; Canada 10,098.
Scrap	1,085	1,388	Sweden 659; France 500.
Unwrought [2]	5,404	1,190	Poland 596; France 167; Denmark 124.
Semimanufactures [2]	1,977	1,937	France 800; Belgium-Luxembourg 565.
Oxide	918	1,130	Poland 455; Sweden 314; West Germany 204.
Other, n.e.s.:			
Ores of nonferrous metals	202	234	Australia 207.
Metal-bearing ashes and residues	230	255	Sweden 209.
Oxides of strontium, barium, magnesium.	175	152	United Kingdom 53.
Metallic oxides, for paint	-------	5,366	West Germany 3,942.
Metalloids	18	12	Sweden 10.
Alkali, alkaline-earth and rare-earth metals.	3	1	NA.
Pyrophoric alloys	3	4	United Kingdom 2.
Metal, including semimanufactures and scrap.	236	469	Republic of South Africa 188; U.S.S.R. 125.
Nonmetals:			
Abrasives:			
Natural (emery, corundum, pumice, etc.).	338	398	Netherlands 160; West Germany 52; United States 50.
Artificial corundum	619	943	West Germany 620; Austria 181; France 130.

See footnotes at end of table.

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Table 3.—Norway: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Asbestos	5,099	5,580	Canada 2,653; Southern Rhodesia 1,211.
Barite, including witherite	461	1,917	United States 673; United Kingdom 520; mainland China 370.
Borates, natural	1,025	825	All from United States.
Boric oxide and boric acid	616	158	Italy 100.
Cement	52,896	7,372	Denmark 2,581; United Kingdom 1,714.
Chalk	6,036	6,688	France 3,846; Denmark 1,237.
Clay and clay products:			
Fuller's earth	1,910	2,370	United Kingdom 2,281.
Kaolin	r 63,738	71,792	United Kingdom 70,968.
Refractory and other clays	34,315	35,778	United Kingdom 21,192; Czechoslovakia 5,574; Sweden 2,439.
Construction materials (bricks, tiles, etc.):			
Refractory	22,679	23,974	Sweden 8,747; Denmark 4,077; United Kingdom 3,964.
Ordinary bricks. thousand units	10,256	10,970	Denmark 9,920.
value, thousand dollars	$2,453	$2,649	Sweden $816; United Kingdom $443.
Other nonrefractory.			
Cryolite and chiolite, natural	4,294	4,513	All from Demark.
Diamond and other precious and semiprecious stones:			
Industrial diamond carats [3]	95,000	5,000	All from Sweden.
Nonindustrial diamond, do. unset.	25,000	115,000	Belgium-Luxembourg 80,000; United Kingdom 20,000.
Other, natural and synthetic stone. kilograms	r 307	383	West Germany 338.
Diatomite and other siliceous earths	3,940	4,382	Denmark 2,033; United States 1,828.
Dolomite	15,829	4,693	United Kingdom 2,357; West Germany 950.
Earth pigments	498	454	West Germany 142; United Kingdom 80; Spain 79.
Feldspar	483	930	All from Sweden.
Fertilizer:			
Raw materials:			
Phosphate rock	173,371	226,090	U.S.S.R. 173,984; Morocco 35,928.
Sodium nitrate	11	147	All from West Germany.
Manufactured:			
Nitrogenous	10,591	475	United Kingdom 245.
Phosphatic, including basic slag.	5,674	7,832	Belgium-Luxembourg 4,443; Sweden 2,308.
Potassic	121,670	157,608	Spain 78,738; France 34,796; West Germany 24,248.
Other	138,822	97,441	Netherlands 79,539.
Ammonia, anhydrous	20,654	24,488	West Germany 23,934.
Flint	1,313	1,358	Denmark 1,064; France 292.
Fluorspar	3,144	2,782	United Kingdom 1,271; mainland China 1,100.
Graphite	284	459	United Kingdom 282; West Germany 99.
Gypsum, including calcined	60,758	77,688	Poland 52,101; France 23,799.
Hydrogen value, thousand dollars	$30	$27	Netherlands $12.
and rare gases.			
Lime	15,851	14,813	Denmark 10,398.
Limestone, for flux, cement, etc	174,416	181,070	United Kingdom 163,741; Sweden 10,744.
Magnesite	3,957	3,753	Mainland China 2,025; Netherlands 1,112.
Mica	6,477	4,981	India 4,775.
Quartz and quartzite	NA	14,356	United States 10,542; Spain 3,475.
Salt	293,793	306,397	Netherlands 124,935; Spain 65,684; United Kingdom 37,766.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	13,200	10,441	Netherlands 5,441; France 4,302.
Caustic potash	1,519	1,390	Sweden 938.
Stone, sand and gravel:			
Dimension stone:			
Crude:			
Granite, gneiss, etc	514	398	Sweden 358.
Marble and other calcareous.	134	303	Italy 223.
Slate	536	816	Denmark 529.
Worked, all types	661	1,674	Sweden 1,179.
Crushed stone and gravel	2,765	3,425	Sweden 2,164.
Sand	27,504	140,408	Belgium-Luxembourg 90,996; Sweden 15,294.
Sulfur:			
Crude	56,375	41,576	United States 28,125; France 11,440.
Purified	1,638	42	West Germany 19.
Sulfuric acid, including oleum	3,650	19,155	Sweden 14,123.
Talc and steatite	4,073	4,889	Mainland China 2,928; United States 1,384.

See footnotes at end of table.

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Table 3.—Norway: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Other nonmetallic mineral materials	31,487	42,070	West Germany 34,777; East Germany 6,924.
Inorganic bases, n.e.s	408	343	West Germany 127; United Kingdom 95; mainland China 52.
Mineral fuels:			
Asphalt and bitumen, natural	r 1,548	1,633	United Kingdom 778; United States 418.
Carbon black	2,449	3,088	United Kingdom 1,769; Netherlands 560; United States 479.
Coal	366,328	372,067	United States 173,311; United Kingdom 104,967; Poland 54,391.
Coal derivatives	17,648	19,563	United Kingdom 11,249; Poland 4,234.
Coke	680,752	741,916	United Kingdom 534,984; West Germany 82,247.
Lignite and peat, including briquets	1,298	2,308	Sweden 2,209.
Petroleum:			
Crude—thousand tons	2,754	2,934	Venezuela 1,257; Iraq 705; Libya 577; Saudi Arabia 349.
Petroleum refinery products:			
Gasoline—thousand tons	498	511	United Kingdom 164; Netherlands 125; West Germany 75.
Kerosine, including jet fuel—do	223	340	United Kingdom 184; Netherlands 83; Denmark 25.
Distillate fuel oil—do	1,255	2,929	United Kingdom 1,106; Netherlands 823; U.S.S.R. 369.
Residual fuel oil—do	1,071		
Lubricants, including grease—do	48	54	United Kingdom 22; United States 16; Netherlands 7.
value, thousand dollars	$77	$108	Denmark $62; France $40.
Petroleum gases.			
Bitumen and other—thousand tons	294	291	United States 165; United Kingdom 68.

r Revised. NA Not available.
1 Not including artificial corundum.
2 Including alloys.
3 Calculated from quantities reported in kilograms.
4 Including spiegeleisen, cast iron, powder, sponge, etc.

COMMODITY REVIEW

METALS

Aluminum.—Norwegian imports of alumina increased to nearly 700,000 tons in 1967 as output of primary metal continued to rise. The production gain, however, was accompanied by a 10-percent drop in exports of aluminum and alloy ingot compared with 1966. Shipments to the United States declined by nearly 30,000 tons.

The industry's productive capacity continued to increase. At Karmoy on the Southwest coast, A/S Alnor began production of metal from a new 80,000-ton-per-year reduction plant. Two potlines were in production by yearend, and construction of a fabricating plant was expected to be completed by mid-1968. A/S Alnor is 51 percent owned by Norsk Hydro-Elektrisk Kvaelstofaktieselskab (Norsk Hydro) and 49-percent by Harvey Aluminum, Inc. Alumina for the plant was being supplied from the new Harvey facility at St. Croix in the Virgin Islands.

The new smelter at Husnes was reportedly operating at full 60,000-ton capacity by the end of 1966. The Husnes facility is operated by Sor-Norge Aluminum A/S, a company formed by Swiss Aluminum, Ltd., the Compadec group,[2] and Norwegian interests.

Significant expansions of productive capacity at the Sunndalsora and Mosjoen smelters were also nearing completion. Annual capacity at Sunndalsora was being increased to 100,000 tons and at Mosjoen to 85,000 tons. Completion of both projects was expected during 1968. The Sunndalsora plant and a 110,000-ton-capacity smelter at Ardal are operated by A/S Ardal og Sunndal Verk (ASV), now jointly owned by the Kingdom of Norway and Alcan Aluminium, Ltd. (Alcan). The Mosjoen smelter is owned by Mosjoen Aluminium A/S, a joint venture of Elektrokemisk A/S and the Aluminum Company of America. Output capacity was also increased in 1967 by Det Norske Nitrid A/S (DNN), jointly owned by Alcan and British Alu-

[2] Compagnie pour l'Etude et le Développement des Échanges Commerciaux, of Paris.

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minium Co., Ltd. DNN operates a 19,000-ton-capacity smelter at Tyssedal and another with an 11,000-ton capacity at Eydehavn. These developments were expected to increase Norwegian productive capacity for primary aluminum to about 490,000 tons annually in 1968.

In late 1967, preliminary work was begun by Mosjoen Aluminium A/S at Lista, on the southern coast, for construction of a 30,000-ton smelter scheduled for completion in 1970.

The acquisition by Alcan of a 50-percent interest in ASV followed an agreement signed by the company and the Norwegian Government on December 16, 1966. The transaction was completed in January, with the Alcan expenditure of stock and promissory notes valued at an estimated $40 million. Under the agreement, Alcan also transferred to ASV its 50-percent interest in A/S Norsk Aluminium and the latter's fabricating subsidiary, A/S Norsk Aluminiumindustri, but apparently retained its 50-percent interest in DNN. As of mid-1967, the Norwegian Government had acquired 1.13 million shares of Alcan common stock from these transactions.

Norway strongly protested proposals by the British Government and several international companies in 1967, to establish aluminum smelters in the United Kingdom with an aggregate productive capacity of 120,000 to 240,000 tons annually by 1974. The protests were based on the allegation that establishment of such an industry in the United Kingdom would be subsidized as much as 40 percent under the British system of investment grants, and that such aid would be contrary to agreements of the European Free Trade Association in which the two countries are members. The British stated, however, that no subsidy would be involved. Norway presently supplies one-third of British aluminum imports, with deliveries of more than 100,000 tons in 1966 and 1967.

Cobalt.—Production of cobalt at the Kristiansand refinery may not have been much less than in 1966, but exports fell nearly 50 percent in 1967. The sharp decline was apparently due to the large quantities of cobalt sold at relatively low prices from the U.S. stockpile in 1967. U.S. imports of cobalt from Norway totaled only 275 tons in 1967, compared with 638 tons in 1966 and 879 tons in 1965.

Copper.—The national output of copper concentrate, which has remained close to 30,000 tons for more than 10 years, was expected to increase by about 50 percent in mid-1968 when the new Tverfjellet pyrite mine near Hjerkinn is scheduled to reach full production. Copper concentrate produced at this mine is expected to constitute more than half the value of production but will account for only about 6 percent of the volume. Presumably, the concentrate will be exported. Practically all of the copper concentrate produced in Norway is a byproduct of pyrite operations.

Exports of copper concentrate declined to 13,200 tons in 1967 while shipments of unrefined copper, normally about 5,000 tons, increased to 6,500 tons. Exports of blister copper usually represent output of the Sulitjelma smelter. Refined copper is produced only at the Falconbridge nickel refinery, and is derived from copper-nickel matte imported from Canada. Exports of refined copper increased slightly, to 14,200 tons.

The Ministry of Industry and Norwegian private interests discussed the exploration of cupriferous pyrite deposits in the Grong and Bidjovagge districts of northern Norway during 1966, but no results were available.

Iron and Steel.—*Iron Ore.*—Unexpectedly heavy export orders were responsible for the 31-percent increase in production of iron ore in 1967. Exports were 900,000 tons higher than in 1966 and included 2.24 million tons of concentrates and 143,000 tons of pellets and sinter. A/S Sydvaranger, which accounted for about 85 percent of the exports and 60 percent of total production, had cut back production in 1966 because of reduced domestic and foreign demand and had planned to produce only 1.25 million tons in 1967. However, export orders totaled 1.4 million tons by April, and by the end of May the company was producing at maximum capacity. Annual output capacity of the company's facilities at Bjornevatn and Kirkenes had only recently been increased to 2.4 million tons from 1.7 million tons in 1965. A 1.2-million-ton pelletizing plant was also scheduled for completion in 1968.

The Rana mine of A/S Norsk Jernverk probably accounted for about 20 percent

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of the increase in national production in 1967. Beginning production in late 1964, this mine produced 465,000 tons of magnetite and hematite concentrates in 1965 and 667,000 tons in 1966. Most of the mine's output is used for production of pig iron at Mo-i-Rana.

Domestic consumption of iron ore in 1967 was estimated at 1.1 million tons, compared with 1.06 million tons in 1966. Imports were further reduced to 2,800 tons.

Ferroalloys.—Production and export of ferroalloys were again at record levels in 1967. Exports rose to 533,000 tons valued at $62 million. Ferrosilicon accounted for most of the increase.[3] Imports of ferroalloy raw materials in 1967 included 63,000 tons of chromite and 535,000 tons of manganese ore with a total value of $17.5 million.

Elektrokemisk A/S (Elkem) began production of ferrosilicon in June at its new Salten Verk plant north of Fauske, in northern Norway. Until completion of the company's Siso hydroelectric powerplant at the end of 1968, the Salten Verk furnace will be operated at 60-percent load on power supplied by Norsk Hydro in Glomfjord. The furnace is rated at 40,000 kilovolt-amperes, and has a production capacity of 40,000 tons annually.

On January 1, 1967, Elkem took over the management of Porsgrunn Elektrometallurgiske A/S (PEA). At the time of purchase in 1966, PEA annual production capacity was 20,000 tons each of ferrosilicon, ferromanganese, and silicomanganese. A new silicomanganese furnace was being added to the plant in 1967, which will reportedly increase capacity by 20,000 tons in early 1968. Because of air pollution problems, production of ferrosilicon may be shifted from Porsgrunn to another Elkem facility.

At the end of 1967, the effective annual output capacity of Elkem plants was apparently 135,000 tons of ferroalloys, including 95,000 tons of ferrosilicon.

In other developments, a new 24,000-kilovolt-ampere ferrosilicon furnace began production in June at the Alvik works of A/S Bjolvefossen. Tinfos Jernverk reportedly increased its ferrosilicon capacity from 50,000 to 80,000 tons annually. At Sarpsborg, A/S Hafslund was building a new ferrosilicon facility that will increase the company's annual productive capacity by 29,000 tons in 1969.

In early 1967, Orkla Grube Aktiebolag announced that its application for a power concession to supply a new 24,000-kilovolt-ampere furnace at Thamshavn had been refused by the Government. The application was filed by Orkdal Norwegian Ferroalloys A/S, a new company formed in late 1966 by Orkla Grube and a Dutch firm, Oxyde Maatschappij vor Ersten en Metalen N. V. The company planned to produce ferromanganese or silicomanganese, in addition to the present output of ferrosilicon, and to market the alloys independently of the Norwegian Ferrosilicon Producers Association.

Norwegian exports of elemental silicon have nearly doubled since 1965. Shipments in 1967 totaled 14,482 tons.

Consumption of ferroalloy raw materials by the metallurgical industry in 1966 included 446,000 tons of manganese ore, 68,700 tons of chromite, 432,000 tons of quartz, and 726 tons of elemental silicon. Consumption of ferroalloys by the same industry was 40,400 tons.

Iron, Steel, and Rolled Products.—Output of pig iron and crude steel in 1967 was estimated at about 85 and 95 percent of the respective production capacities. While no details were available, production and consumption patterns were probably much the same as in 1966. A/S Norsk Jernverk and Christiania Spigerverk remained the principal producers, and the former company probably accounted for most of the increases in metal output. Production of iron and steel by these companies in 1965 and 1966 follows, in thousand metric tons:

	A/S Norsk Jernverk		Christiania Spigerverk	
	1965	1966	1965	1966
Pig iron	446	550	78	81
Steel:				
Crude, ingots	492	543	139	139
Rolled	e 400	e 450	113	114

e Estimate.

All pig iron was made in electric furnaces. Output by Norsk Jernverk at Mo-i-Rana was based mainly on iron ore from

[3] Production, export, and productive capacity of ferrosilicon is reported only on a 45-percent-silicon basis.

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the Rana mine, supplemented by ore from the Sydvaranger and Fosdalen mines. Pig iron produced by Christiania Spigerverk was made at Svelgen by the Bremanger Smelting Works from ore produced at the Rodsand mine. Part of the basic product at Svelgen, pig iron containing vanadium and titanium, was marketed as such, and part was further processed to a high-purity pig iron.

About 40 percent of the steel made by Norsk Jernverk in 1966 and all of that made by Christiania Spigerverk was produced in electric furnaces, largely from scrap. The remaining share of Norsk Jernverk steel was produced in Linz-Donawitz converters, apparently exclusively from pig iron.

Exports of pig iron in 1967 declined to 155,000 tons, apparently because of reduced purchases by Italy and the United Kingdom. Exports of billets, slabs, and other crude forms of steel increased to 175,000 tons, owing mainly to increased shipments to Denmark and the United Kingdom. Except for these commodities, changes in the quantities of iron and steel traded in 1967 compared with 1966 did not appear significant. Exports of iron and steel in 1967 were valued at $60 million, and imports were valued at $133 million.

Norway continued to depend on imports for the larger share of its steel requirements, especially the sheet and plate steel which makes up about 40 percent of domestic consumption. Imports of the latter items in 1967 totaled 466,000 tons, including 285,000 tons of heavy plate that is primarily used by the shipbuilding industry.

Inadequate rolling facilities for flat products, distance from markets, and competition from West European steel producers continued to be serious problems for A/S Norsk Jernverk, and an operating loss was again reported for the State-owned company in 1967. Plans to reorganize and refinance the company with the assistance of Christiania Spigerverk and Elektrokemisk A/S, proposed in 1965 by the Backe investigative committee, were apparently abandoned by 1967.

Lead and Zinc.—Exports of lead concentrates totaled 7,100 tons in 1967, reflecting the slight drop in production. The Bleikvassli mine at Korgen normally accounts for 85 to 90 percent of the total output, with a few hundred tons annually contributed by Bergverkselskapet Nord-Norge A/S in Nord-Rana. Imports of pig lead totaled about 9,500 tons in 1967.

These two companies also account for more than half of the mine-zinc output. A breakdown of zinc concentrate production, by company, for 1965 and 1966 follows:

Company	Production (metric tons)	
	1965	1966
A/S Bleikvassli Gruber	10,237	9,900
Bergverkselskapet Nord-Norge A/S	5,217	5,604
Folldal Verk A/S	4,276	4,878
A/S Sulitjelma Gruber	2,745	2,625
Killingdal Grubeselskab	2,077	1,930
A/S Vigsnes Kobberverk	396	996
Total	r 24,948	r 25,933

r Revised.

Folldal Verk A/S expects to produce an additional 4,500 tons of zinc concentrates annually by mid-1968 from its pyrite mine at Tverfjellet.

Det Norske Zinkkompani A/S was reportedly expanding the output capacity of the Eitrheim zinc smelter to 64,000 tons annually. Exports of slab zinc declined to 36,100 tons in 1967.

Magnesium.—Output of magnesium by Norsk Hydro for the year ended June 30, 1967, was approximately 28,800 tons. Sales of metal during the same period increased to about 33,000 tons compared with 27,500 tons in 1965–66, and sales of magnesium oxide increased 50 percent. The company continued to improve plant facilities at Heroya, and the capacity for metal production was expected to reach 36,000 tons annually during 1968. Construction of the magnesium-fabricating facility at Rjukan was believed to have been completed in 1967.

Exports of magnesium in 1967 totaled 30,112 tons valued at about $17 million.

Nickel.—Imports of copper-nickel matte from Canada were 14 percent less than in 1966, the lowest since 1964. The value reduction of $5 million was only 8 percent less than that for 1966, apparently owing to the rise in prices for nickel in the latter part of the year. Exports of nickel also declined 5 percent, but in-

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creased in value by $3.7 million compared with 1966. The United States continued to be the principal buyer, although shipments were 1,170 tons less than in 1966. Exports to Sweden increased to 5,700 tons.

Platinum-Group Metals.—Exports of platinum-group metals in 1967 increased by 35 percent compared with 1966, despite the reduced output of nickel and copper at the Kristiansand refinery. The bulk of the shipments continued to go to the United States. U.S. imports for consumption of these metals from Norway for the past 3 years follows:

	Troy ounces			Value, thousands		
	1965	1966	1967	1965	1966	1967
Platinum:						
Grains, nuggets	3,000	3,350	5,170	$404	$459	$673
Sponge	3,630	3,175	1,275	490	431	166
Palladium	7,699	5,150	4,676	233	170	200
Other	NA	1,935	4,485	NA	280	587
Total	NA	13,610	15,606	NA	1,340	1,626

NA Not available.

Source: U.S. Department of Commerce, Bureau of the Census.

Titanium.—A/S Titania reportedly planned to produce 400,000 tons of ilmenite concentrate in 1967. Exports totaled 350,000 tons, and an additional 50,000 tons was expected to be delivered to the titanium dioxide plant of A/S Titan at Fredrikstad. Expansion of the titania plant, reportedly to a production capacity of 15,000 tons annually, was completed during 1966. Although no data on titania production have been released, imports of this commodity in 1967 were only 1,123 tons compared with 9,100 tons in 1965.

Vanadium.—Christiania Spigerverk increased production of ferrovanadium at Svelgen in 1967. Exports for the year were 178 tons, valued at about $506,000 as compared with 22 tons in 1966. The vanadium was formerly recovered only as slag during the production of oxygen-blown pig iron. The company produces 75,000 to 80,000 tons of vanadium-titanium pig iron annually, part of which is sold and part of which is further refined. The source of vanadium is magnetite concentrate from the company's Rodsand mine at Nesset.

NONMETALS

Cement and Other Construction Materials.—The rise in cement production in 1967 was due to increased capacity of the two major cement producers and to increased export sales. A new rotary kiln, installed in 1967 by A/S Christiania Portland Cementfabrik, increased the company's annual productive capacity to 1.1 million tons. In 1966, A/S Dalen Portland Cementfabrik had increased the capacity of its Brevik works to 1.2 million tons annually by installation of a 23-foot Aerofall mill. The latter company probably accounted for the larger share of Norwegian exports of cement in 1967, which totaled 613,000 tons valued at $5.4 million.

Exports of feldspar increased nearly 20 percent in 1967, to 107,000 tons. The total included 63,000 tons of nepheline syenite, production of which has been increasing since 1961. The nepheline syenite is produced by A/S Norsk Nefelin, a subsidiary of Christiania Spigerverk at Stjernoy in the northern Lofoten islands. It is used in the glass and ceramics industries.

Exports of unfinished building stone, largely consisting of an iridescent dark syenite called "labrador," totaled nearly 50,000 tons in 1967 and were valued at $3.7 million.

Fertilizer Materials.—Exports of manufactured fertilizers in 1967 declined by 300,000 tons and by $12 million in value compared with 1966. The decline appeared to be due mainly to unfavorable market conditions for lime nitrate, the principal export item. Production of lime nitrate had been cut back by Norsk Hydro in late 1966, and exports in 1967 were 400,000 tons less than during the previous year. On the other hand, im-

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ports of potash and raw phosphate were higher than in 1966 and there was increased production and export of "complete" fertilizer. Norsk Hydro's production capacity for "complete" fertilizer increased by 400,000 tons annually, with completion of a new plant at Heroya in October. The company also granted worldwide, nonexclusive license for its Nitrophosphate process to Wellman-Lord, Inc., of Lakeland, Fla., in 1967.

Construction of a large ammonia plant at Heroya was continued by Norsk Hydro. Blasting work for underground storage of naphtha was completed in May, and the entire plant was to be completed early in 1968. The plant will have an annual productive capacity of 350,000 tons of ammonia using a steam-reforming process with naphtha as raw material. Output of ammonia by the company during the operating year ended June 30, 1967 was 450,000 tons.

Pyrite and Sulfur.—The 5-year decline in pyrite production was expected to be reversed in 1968 by operations at the Tverfjellet mine developed near Hjerkinn by Folldal Verk A/S, a subsidiary of A/S Borregaard. Pyrite production at Tverfjellet was expected to reach the planned rate of 220,000 tons annually by August 1968. The pyrite will be shipped to the parent company's new sulfuric acid plant, completed in late 1966, at Sarpsborg, near Fredrikstad. This plant may have been largely responsible for the nearly 50-percent increase in Norwegian production of sulfuric acid that took place during 1967. Crude ore reserves at Tverfjellet, localized in three orebodies ranging in thickness from 26 to 100 feet and extending to a minimum depth of 1,200 feet, were stated to be 8 million tons. The planned rate of ore extraction was 400,000 tons annually and may be increased to 600,000 tons. The mine will also produce significant quantities of copper and zinc.

The increase in production of sulfuric acid in 1967 was accompanied by a decline of 70,000 tons in exports of pyrite and an increase of 55,000 tons in exports of roasted pyrite compared with 1966. Imports of elemental sulfur were reduced about 10 percent, to 37,750 tons. Most of the elemental sulfur is used by the paper industry, which consumed 32,500 tons in 1966 in addition to 62,000 tons of pyrite.

The Borregaard company negotiated a long-term contract in 1966 to supply sulfuric acid to A/S Titan, the Norwegian manufacturer of titanium dioxide at Fredrikstad. The latter company, a subsidiary of the National Lead Co., represents about half of the potential market for acid from Borregaard's Sarpsborg plant.

Orkla Grube AB was building a new concentration plant at Lokken. The plant will have a capacity of 210 tons of pyrite per hour and is scheduled for production in mid-1968.

MINERAL FUELS

Coal and Coke.—Production and export of coal in 1967 from West Spitzbergen, Norway's only domestic source, were about the same as in 1966. The sole operating company, Store Norske Spitzbergen Kulkompani A/S, presumably continued trial mining at a new location near Longyearbyen. The test operation was scheduled for a 2-year period, beginning in the summer of 1966. Production will begin in 1969 if the new mine proves to be economic.

Spitzbergen exported 140,000 tons of coal in 1967, primarily to West Germany. Imports of coal increased to 422,000 tons, mostly from the United States. Coking coal from West Virginia was being used successfully by Norsk Koksverk A/S in a mixture with Spitzbergen coal to produce metallurgical coke for the steelworks at Mo-i-Rana. The State-owned company had been unable to fulfill delivery contracts for coke, as well as for byproduct ammonia in 1965, but apparently met production requirements in 1966.

Imports of coke in 1967 declined by 110,000 tons while exports were unchanged from the 1966 level. Industrial consumption of oven coke in 1966 was about 610,000 tons, of which 515,000 tons was consumed by the metallurgical industry and 85,000 tons by the basic chemicals industry. Total consumption of gas coke was about 300,000 tons. Industrial consumption of coal in the same year was 602,000 tons, including 300,000 tons in cokeworks and 100,000 tons in the iron and steel industry.

Petroleum.—Exploration for oil and gas in the Norwegian continental shelf areas was continued in 1967 by several company groups, but no commercial discoveries were reported. Traces of oil

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or gas were reported from two of the four holes drilled by Esso Exploration Norway, Inc., and the firm planned to begin drilling a fifth hole in the fall. Drilling at Blahuken, Spitzbergen, begun in 1965 by Caltex (California Asiatic Oil Co. and Texaco Overseas Petroleum Co.), apparently gave unfavorable results, and operations were discontinued in 1966. A/S Petronord, owned 20 percent by Norsk Hydro and 80 percent by a group of seven French companies, apparently concluded an agreement with the Phillips group (Phillips Petroleum Co., with subsidiaries of Petrofina, S.A., and Ente Nazionale Idrocarburi) by which each organization acquired a 20-percent interest in the other's concession area. The Phillips group was expected to begin drilling its first hole in late 1967, about 65 miles south of Esso's fifth hole.

A Norwegian banking group acquired 51 percent of Syracuse Norge A/S, which has exploration concessions southwest of Lista. The company reportedly carried out 1,000 miles of seismic surveying, and drilling was expected to begin in 1968.

A group of American and European oil companies, headed by Standard Oil Co. of Indiana, was expected to begin drilling off the western coast of Norway in 1967 from a converted 23,000-ton whaling ship. The ship has been outfitted especially for deep-water drilling.

Crude Oil Refining.—Imports of crude oil in 1967 increased to nearly 3.2 million tons. A/S Norske Esso continued to expand the capacity of its Slagen refinery, and planned to increase crude oil storage capacity by 80 percent, to 500,000 cubic meters. The refinery was expected to have a processing capacity of 4 million tons annually in 1968.

The Sola refinery of A/S Norske Shell near Stavanger was scheduled for completion in early 1968. The plant will have a processing capacity of about 2 million tons annually and underground storage for 220,000 tons of crude oil.

Petroleum Products. — Domestic consumption of petroleum products for energy uses in 1965 and 1966 follows:

Product	Consumption (thousand metric tons)	
	1965	1966
Gasoline	647	685
Jet fuel	81	124
Kerosine	143	190
Distillate fuel oil	762	891
Residual fuel oil	2,498	2,918
Liquefied petroleum gas	10	13
Refinery fuel	90	100
Total	4,231	4,921

Source: Organization for Economic Cooperation and Development, (OECD) (Paris). Basic Statistics of Energy 1952–66. Paris, 1968, pp. 231–233.

Increased output of refinery products was accompanied by a leveling-off of the trend in imports. Total imports rose by only 27,000 tons in 1967 whereas the increase in 1966 was more than 700,000 tons. The main reduction was in fuel oils, imports of which declined by 107,000 tons. Imports of petroleum coke, an important item for the country's electric furnaces, rose from 172,000 tons in 1966 to 193,000 tons in 1967. Imports of kerosine and white spirit declined by only 15,000 tons, although substantial production of these commodities was reported for the first time in 1967.

An increase of 80,000 tons in total product exports in 1967 resulted from increased shipments of gasoline and fuel oils.

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The Mineral Industry of Pakistan

By J. M. West [1]

During 1967, Pakistan's first steel mill of any size opened at Chittagong in East Pakistan; planning continued on one or more steel mills in West Pakistan. An oil refinery was being completed at Chittagong, and expansions of refining capacity at Karachi were planned. Natural gas was used more widely and oil discoveries were reported. With the Government's interest in promoting agriculture, a number of fertilizer plants were in planning.

Pakistan contributed little to world mineral supplies; its limited mineral exports included mainly cement, chrome ore, marble, oil products, and salt. It's trade balance remained in deficit despite efforts to expand exports, partly because of necessary imports of basic commodities such as crude oil, steel, nonferrous metals, fertilizers, and coal. Cement exports from West Pakistan continued to partially offset cement imports necessary for East Pakistan.

According to preliminary estimates, Pakistan's gross national product rose by 5.2 percent during the financial year ending March 31, 1967, and for 1967 was reported at $4,280 million [2] (in current prices). The index of mining, a guide to mineral industry activity, reached 193.0 in 1966–67 (base year 1959–60=100), only a few points higher than in 1965–66. Inflationary pressures continued and the overall wholesale price index rose 14 percent in 1966–67 compared with a 4.5 percent rise in 1965–66. Industrial output was not up as much as expected, partly because of power shortages, attributed to low river flows and breakdowns at several power stations including Multan, in West Pakistan, and Karnaphuli, in East Pakistan. A significant part of existing industrial facilities operated below capacity in 1967 because of continued raw materials shortages. In 1967, the country's population totaled an estimated 120 million people, nearly 55 percent in the eastern part of the country that constitutes only about 15 percent of the total land area of some 365,530 square miles. Only a small fraction of the population was employed in the mineral industry; an estimate for coal mining employment was 13,000 workers.

The Government continued to pursue its policy of international nonalignment and since confrontations with India in 1965 has had little or nothing to do with that country in an economic way.

Project aid was slower than anticipated in the original third 5-year plan (1965–70), in part because of tight foreign exchange and revisions emphasizing agriculture in preference to industry. Problems of importing goods have been intensified by freight surcharges since closing of the Suez Canal and by sterling devaluation.

In August 1967, the Executive Committee of Pakistan's National Economic Council approved two new fertilizer projects involving United States firms—Hercules Corp. and American Cyanamid Co. It also decided the Fauji Foundation (domestic) should proceed with initial planning for a petrochemical complex at Karachi to utilize naphtha from local refineries. The Japanese firms, Hitachi Engineering Co. and Tokyo Engineering Co., and the West German firm of Hoechst A.G. were said to be interested in investing in this project.

Projects approved by the Council in December 1967 included a comprehensive scheme for procurement, distribution, and sale of fertilizer in East Pakistan during the third 5-year plan and construction of a triple superphosphate plant at Chittagong. The Council also granted six oil exploration licenses to the quasi-Government Oil and Gas Development Corp.,

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from Pakistan rupees (PRs) at the rate of PRs 4.76=US$1.

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covering areas in both East and West Pakistan.

Plans were discussed for development of gas resources in the Jaldi area of East Pakistan and oil and gas in the Sari area, West Pakistan. For future power needs in East Pakistan, the Government anticipates having to draw on atomic power, so it has proposed a 140,000-kilowatt or larger nuclear power plant at Rooppur.

PRODUCTION

Production levels for most mineral commodities in 1967 remained about the same as in 1966, with significant increases in output for only a few commodities such as chromite, cement, and gypsum. Domestic coal production supplied only one-third to one-half of requirements and projects were underway to expand mine operations. Output of natural gas continued a steady rise, partly due to increased fertilizer production.

Table 1.—Pakistan: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Antimony:					
Concentrate	15	160	119	NA	NA
Metal content of concentrate [e]	8	82	61	NA	NA
Chromite	14,536	13,503	14,490	27,147	[3] 14,802
Iron and Steel:					
Iron ore [2]	68	4,824	23,429	[e] 5,000	NA
Crude steel	[3] 11,590	12,169	NA	NA	NA
Lead ore	73	22	NA	NA	NA
Manganese ore	1,409	996	[r] 508	[r] 126	NA
Nonmetals:					
Barite	4,919	12,007	[r] 7,200	[r] 7,824	[e] 10,000
Bentonite	432	290	NA	NA	NA
Celestite	385	269	451	[r] 690	[3] 209
Cement [4] thousand tons	1,498	1,546	1,707	[r] 1,745	2,038
China clay	NA	983	1,289	3,001	[3] 1,456
Dolomite	648	720	[r] 423	[r] 492	NA
Fertilizer [5]	254,481	233,000	[r] 239,000	[r] 189,000	213,124
Fire clay	35,900	16,790	13,610	[r] 31,500	[3] 9,201
Fullers earth	12,800	7,000	11,823	5,435	NA
Gypsum	[r] 197,701	[r] 195,369	[r] 149,428	[r] 112,995	[3] 74,291
Limestone [6] thousand tons	1,418	1,900	1,850	2,256	[3] 1,263
Magnesite	878	617	523	[r] 736	2,042
Marble	7,289	9,736	7,328	9,596	NA
Mica kilograms	726	4,318	6,858	NA	NA
Salt:					
Rock thousand tons	242	197	271	[r] 262	[3] 133
Other do.	212	194	223	196	451
Silica sand	23,870	25,965	30,947	36,684	NA
Sulfur	NA	1,500	NA	NA	NA
Talc (reported as soapstone)	1,870	2,559	2,844	3,283	[3] 1,600
Mineral fuels:					
Coal thousand tons	[r] 1,223	1,214	[r] 1,471	[r] 1,358	NA
Natural gas [6] million cubic feet	49,459	59,100	66,194	76,000	NA
Petroleum:					
Crude thousand 42-gallon barrels	3,514	3,743	3,943	2,502	NA
Refinery products:					
Gasoline do.	2,219	[e] 2,700	2,873	NA	NA
Kerosine do.	1,546	[e] 2,239	3,853	NA	NA
Distillate fuel oil do.	NA	[e] 3,800	5,440	NA	NA
Residual fuel oil do.	NA	[e] 4,000	7,680	NA	NA
Lubricants do.	NA	97	95	NA	NA
Other do.	NA	183	[7] 92	NA	NA
Total do.	NA	13,019	20,033	NA	NA

[e] Estimate. [r] Revised. NA Not available.

[1] Except where otherwise noted, output is all from West Pakistan.

[2] Officially reported as iron ore but consists of test lots obtained during exploration which were not used to recover iron.

[3] Includes East Pakistan as follows: Ingot steel, 1963—2,118.

[4] Includes East Pakistan as follows: Cement, 1963—77.

[5] Includes: In 1966, urea, 131,169; superphosphate, 5,324; and ammonium sulfate, 41,511. In 1967, urea 162,108; superphosphate, 5,265; and ammonium sulfate, 45,751.

[6] Includes East Pakistan.

[7] Includes bitumen only.

[8] Six months only.

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TRADE

Recent data on Pakistan's mineral commodity trade are limited, but a few general statistics for the last several fiscal years (ending March 31) are reported.

	Value (million dollars)		
	1964–65	1965–66	1966–67
Imports:			
Selected mineral commodities:			
Iron and steel, including manufactures	184	100	134
Nonferrous metals, including manufactures	22	15	31
Chemicals, including manufactures	23	12	21
Total	229	127	186
Other commodities	901	757	904
Total, all imports	1,130	884	1,090
All Exports, total	506	570	632
Overall trade balance	−624	−314	−458

Of all exports in 1966–67, about 13 percent were done on the basis of barter, chiefly with Switzerland. Mineral commodities comprised an estimated 10 percent of Pakistan's total export value and probably 20 to 25 percent of its import value, principally because of the quantity of petroleum imported.

Generally, Pakistan has been finding improved markets in Communist countries for its manufactured products in recent times, and trade has been swinging in that direction. Recent trade agreements have committed the U.S.S.R. to supplying Pakistan with pig iron, zinc, asbestos, and urea fertilizer. In another agreement, Poland will supply coal and coke, fertilizers, chemicals, and iron and steel products in exchange for chromite and mica, among other things. Imports from North Korea increased to $350,000 in 1966–67 and agreements for 1968 were expected to include pig iron, cement, steel, and fertilizers.

Table 2.—Pakistan: Export value and destinations of mineral commodities, 1966–67 [1]

Commodity	Value (thousand dollars)	Principal destinations and percent of total
Cement	1,013	Oman-Trucial States 31; Switzerland 23.
Chrome ore	NA	United Kingdom 17; France 15; Italy 13; West Germany 12.
Marble chips and slabs	453	Italy 74.
Petroleum products	4,150	United Kingdom 44; Switzerland 41.
Precious stone	102	Hong Kong 48; Switzerland 23.
Salt	391	Japan 37; United Kingdom 25; Kenya 10.

NA Not available.
[1] Financial Year ending March 31, 1967.
Source: Export receipts, 1966–67, State Bank of Pakistan, Department of Statistics, Karachi.

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Table 3.—Pakistan: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964
Metals:		
Aluminum and alloys:		
Unwrought	5,145	22,722
Semimanufactures	2,436	3,798
Arsenic and oxides	24	10
Copper and alloys:		
Unwrought	2,513	327
Scrap	126	126
Semimanufactures	5,226	713
Iron and steel:		
Scrap	886	988
Pig iron	51,525	65,397
Ferroalloys	582	294
Ingots and primary forms	229,893	346,256
Lead and alloys:		
Ore	259	338
Unwrought	1,144	6,160
Semimanufactures	15	98
Mercury, 76-pound flasks	925	153
Tin and alloys, long tons	380	683
Zinc and alloys	r 2,825	5,040
Nonmetals:		
Asbestos cement sheets	527	136
Barite	9	112
Borax	345	452
Cement, thousand tons	[2] 937	NA
China clay	1,439	2,963
Fertilizer materials:		
Nitrate	153,718	NA
Potash salts	147	1,176
Graphite	448	482
Nonmetals—Continued		
Salt	1,946	r 2,643
Sulfur	4,842	17,220
Mineral fuels:		
Coal, coke, pitch, and tar thousand tons	1,251	726
Petroleum: [2]		
Crude thousand 42-gallon barrels	13,100	15,592
Refinery products:		
Gasoline, do	576	r 275
Kerosine, do	2,708	r 8,079
Distillate fuel oil do	2,720	r 7,391
Residual fuel oil do	2,074	
Lubricants, do	r 608	376
Other, do	114	r 393
Total, do	r 8,795	r 16,514

r Revised. NA Not available.

[1] Except where otherwise noted, data are derived from: Statistical Summary of the Mineral Industry World Production, Exports and Imports 1960–65. Overseas Geological Surveys, Mineral Resources Division, London, 1966, pp. 416.

[2] Based on data from various dispatches from the U.S. Embassy, Karachi, Pakistan.

Table 4.—Pakistan: Value of imports and exports of mineral commodities

(Thousand dollars)

Commodity	Imports		Exports	
	1964	1965	1964	1965
Metals:				
Iron and steel	143,852	125,538	44	NA
Metalliferous ore and scrap	460	1,257	725	582
Nonferrous metal and scrap	18,782	17,161	34	155
Nonmetals:				
Abrasives	125	247	-----	-----
Asphalt and bitumens (natural)	1,495	238	-----	-----
Cement and building products	20,935	9,845	NA	NA
Clays and refractory material	1,466	1,289	-----	-----
Fertilizer (crude and manufactured)	3,884	9,753	r 0	-----
Refractory minerals	501	519	-----	-----
Salt	96	NA	456	426
Sulfur	353	NA	-----	-----
Mineral fuels:				
Coal, coke briquets	11,503	12,116	-----	-----
Petroleum:				
Crude	r NA	NA	-----	-----
Refinery products	44,149	22,436	4,007	4,952
Total value	r 247,601	200,399	r 5,266	6,115

r Revised. NA Not available.

COMMODITY REVIEW

METALS

Chromite.—The sharp rise in chromite production in 1965–67 was attributed partly to world market restrictions affecting Southern Rhodesian supplies. Pakistan Chrome Mines, Ltd., the country's only producer, was expected to increase output 10 percent in 1968. Production presumably came from the Hindubagh and possibly the Hari Chand areas of West Pakistan.

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Iron and Steel.—The Kalabagh steel mill project was approved in October 1967 by the West Pakistan Provincial Development Working Party but further action awaited recommendation from the National Economic Council of the Central Government. Estimated overall cost was $292 million of which about two-thirds would comprise foreign exchange for external goods and services. The plant, if built, is expected to use the Salzgitter process, developed in West Germany, for pulverizing and upgrading ores from the Kalabagh area. Experts from several countries, including the U.S.S.R. and Italy, were studying investment potential.

Pakistan's first steel mill was opened at Chittagong in 1967. The 150,000-ton-per-year capacity mill was troubled with problems of staff (overstaffing, in part), prices, and sales management. The plant will operate almost exclusively on imported raw materials. In December, $3.3 million worth of Soviet pig iron was contracted to supply in part the needs of this mill and a shipyard in Karachi. Other Communist countries will be also supplying pig iron to Pakistan.

In November, a Cabinet committee met to discuss plans for a steel mill at Karachi. Reports outlining proposals for a $262 million 500,000-ton-per-year plant were submitted by National Steel of Pakistan, Ltd., and Industrial Managements, Ltd. National Steel of Pakistan is believed to be a consortium of French, Polish, Czechoslovakian, West German, and Japanese firms. The second proposal involved a consortium of Industrial Managements, Ltd. and eight foreign companies including Koppers Co., Inc., of the United States. If constructed, the plant is expected to use Australian iron ore and West German coal.

Uranium.—Carnotite-type (actually metatyuyamunite) mineralization has been discovered in cemented sandstones of lower Pliocene to upper Miocene age in the foothills of the Sulaiman Range in West Pakistan. Exploration to date has suggested presence of a large low-grade uranium deposit and deeper drilling has been scheduled for 1968. In East Pakistan, black sands containing significant tonnages of monazite, zircon, rutile, and ilmenite were under investigation.

NONMETALS

Cement.—Operation of West Pakistan Industrial Development Corporation's (WPIDC) Zeal Pak cement plant at Ganjo Takkar was expected to start in 1967 with four kilns and a 480,000-ton-per year capacity. Two more 300,000-ton capacity kilns were planned. A 15,000-ton-per-year white cement plant was planned for the Maple Leaf Cement plant at Iskanderabad. Two Lepol kilns were operated at the 330,000-ton-per-year Valika Cement Ltd. plant near Karachi. Pakistan Progressive Cement Industries Ltd. was completing a new plant about 100 kilometers northwest of Rawalpindi, and Ismail Cement Industries Ltd. had a new 360,000-ton-per-year plant in operation at Gharibwal. Associated Cement Companies Ltd. had plants in operation at Rhri, Sukkur, and Wah, in the Rawalpindi district.

The 150,000-ton-per-year Chattak plant of East Pakistan Industrial Development Corp. (EPIDC) remained the only cement plant in East Pakistan. Limestone reserves at Buklabazar apparently are adequate to assure continued operations at Chattak, but a second plant to be built by 1968 under an agreement with the French firm Société Fives-Lille Cail and probably to be located at Chittagong will produce about 1,000 tons of cement per day from imported clinker.

Because of the short supply of cement in East Pakistan, numerous illegal transactions and thefts were reported. In contrast, cement supply in West Pakistan has generally been adequate to supply requirements and permit export.

Ceramics.—Pakistan Ceramic Industries Ltd. operated its new partly Japanese-financed ceramics plant at Tongi, near Dacca. It was expected to produce about $2 million worth of plates and related objects annually, using local raw materials.

China clay deposits in an area northwest of Saidu are believed good enough to supply a modest-size porcelain and whiteware plant. The deposits occur in lenticular bodies in an area of metasediments intruded by acidic igneous rocks.

Fertilizer Materials.—The Pakistani Government placed major emphasis on fertilizers in the third 5-year plan. The plan provides for about seven State-owned

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plants in East and West Pakistan with annual capacities totaling 1 million tons of urea, 500,000 tons of ammonium sulfate and nitrates, and 240,000 tons of triple superphosphate. In addition, two privately owned plants have been authorized. Immediate use of $50 million in United States credits was to be made for importing fertilizers. Tunisian participation was proposed in a 150,000-ton-per-year chemical fertilizer plant at Karachi to be completed by 1969.

Jordan agreed to supply WPIDC with 30,000 tons of phosphate rock annually for the Lyallpur superphosphate plant. Part of a $60 to $70 million credit offered by Czechoslovakia was marked for a fertilizer plant. Standard Oil Co. of New Jersey (ESSO) is a majority shareholder in the $26 million, 173,000-ton-per-year urea plant scheduled to go into production in mid–1968 at Daharki. Pakistan's Hyesons Group of Industries and Kaiser Aluminum & Chemical Corp. reached accord with Japanese firms, Toyo Engineering Corp. and Mitsui and Co. Ltd., for construction of a $50 million 340,000-ton-per-year urea plant near Mirpur Mathelo. The Agency for International Development (AID) was expected to give support to the project, that is to operate under the name, Hyesons Agricultural Chemicals Limited.

Gypsum.—Gypsum mining is a sizable industry and vast reserves are known in the Salt Range and in the Kohat Salt Range in northern West Pakistan. Status of a gypsum board plant that was supposed to be built between Lahore and Rawalpindi is unknown. A crushing and grinding plant has been erected at Lahore to process gypsum from the Daudkel area.

Strontium.—Veins in Eocene age limestones near Kalukuhar and Thano Bulan Khan, in the Hyderabad area of West Pakistan, continued to yield celestite. The main deposit is about 37 kilometers northwest of Jungshahi and 29 kilometers southwest of Thano Bula Khan.

MINERAL FUELS

Coal.—Although coal traditionally has been an important fuel in Pakistan, the country is far from self-sufficient; nearly half of the estimated 2.5 million tons consumed in 1966 was imported, principally from mainland China and East European countries. Recently, large additions have been made to known resources and the prospect is good for expanded output with modernizing of mine facilities. Some progress was being made in exploiting new reserves estimated at 1,000 million tons or more in the Bogra-Rajshahi districts of East Pakistan. In this area, seven coal seams ranging from 2.3 to 105 feet in thickness have been discovered in surveys by the United Nations, the Pakistan Government, and West Germany's Krupp Rohsoffe Co. At Gondwana there is a reportedly high-grade bituminous coal which can be made, as tests have indicated into a fair metallurgical coke.

EPIDC called for bids in May 1967 for sinking and lining two 24-foot-diameter, 3,900-foot-deep shafts at its Jamalganj Coal Project; full-scale mining was expected sometime after 1970.

In West Pakistan, large lignite and subbituminous coal deposits have been found, with surveys to date indicating estimated reserves of 363 million tons outside of the already developed Quetta region. Heat values of samples have been generally above 7,000 Btu's per pound, and use for electric power generation is being considered.

A pilot low-temperature carbonization plant was reportedly placed in operation recently at Quetta with annual capacity of some 40,000 tons of coke briquets. Deposits under development in West Pakistan include the Sor Range, Sharigh, and Mach in the Quetta area; Makersal and Salt Range northwest of Lahore; and Jhimpir-Meting and Lakhra, northeast of Karachi. Mining conditions are generally poor in the steeply pitching, relatively thin coal seams near surface, and little mechanization has been possible; however, longwall techniques have been adopted in a few mines with thicker seams and more uniform structure.

Petroleum.—Despite discouragement expressed among some experts, a reportedly substantial discovery of oil was made with Soviet technical help in 1967 at Kot Sarang, in the Campbellpur district, about 110 kilometers southwest of Rawalpindi and 30 kilometers from Dhulian. The discovery well was said to have produced at a rate of 500 to 1,000 barrels per day of 26° to 30° API gravity crude oil from a depth of 13,200 feet. A few weeks later a well at Tut, about 120 kilometers west

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of Rawalpindi, struck oil in Jurassic sandstone at 14,645 feet, and the flow was reported at 1,400 barrels per day of 40° API gravity. Moreover, substantial quantities of natural gas appeared to be present. Pakistan Shell Oil Co. is continuing its search for oil in an 8,000-square-mile concession area in the Bay of Bengal.

Indigenous crude oil production has supplied less than one-fourth of domestic crude requirements. The country's annual product consumption has reached about 3.5 million barrels. During 1966, imports comprised an estimated 18.85 million barrels of crude oil and 7.05 million barrels of products, and exports were 1.82 million barrels of products. Crude oil was supplied chiefly from Iran.

Exploitation in 1967 was largely confined to the Dhulian, Khaur, Joya Mair, Karsal, and Balkassar fields in the Potwar Plateau in northern West Pakistan. The most important of these is the Dhulian field, exploited by the Attock Oil Co., which also operates a 9,000-barrel-per-day refinery at Morgah, near Rawalpindi.

Other refineries operating included the 50,000-barrel-per-day Pakistan Refinery Ltd. and the 11,000-barrel-per-day National Refinery Ltd. plants at Karachi. A sizable expansion has been proposed for the latter in 1969–70, with American International Oil Co. (United States) and National Iranian Oil Co. interested in joint investment. At Chittagong, in East Pakistan, the 20,000-barrel-per-day Eastern Refinery Ltd. plant neared completion. All of the seaboard refineries are expected to operate on imported crude, those in the west drawing from the Persian Gulf area while the Chittagong refinery is expected to purchase at least half of its crude from the Burmah Oil Co., which has bought the French equity in the plant.

Natural Gas.—Natural gas provided about one-third of Pakistan's energy requirements in 1967. Producing gasfields, with total reserves of the order of 20.3 trillion cubic feet, included the Sui and Dhulian in West Pakistan and the Sylhet and Chattak in East Pakistan. About four-fifths of the output continued to come from Sui, which in 1967 supplied Karachi and is slated to soon supply Lahore via a recently initiated pipeline project. The entire East Pakistan supply went to the Fenchuganj fertilizer operations, but work was nearing completion on a pipeline connecting Dacca with the Titus gasfield, and priority was being given to planning a pipeline from the Jaldi area to Chittagong, in expectations that gas shows prove adequate. Gas from the Titus field is also being considered for thermal electric plants at Ashuganj (120,000 kilowatts) and Sindhirganj (60,000 kilowatts) and for a projected fertilizer plant at Thorasal.

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The Mineral Industry of Peru

By Lester R. Brown, Jr.[1]

Peru's mineral industry suffered a decline in terms of dollar value of mineral production in 1967 compared with that of 1966; output value decreased from $477 million to $431 million. The total mineral production value does not include values for steel and refined petroleum products.

The Peruvian sol, valued at 26.82 soles per U.S. dollar for 9 years, declined after September 1, 1967, in stages to what appeared to be a stabilized value of 38.70 soles per U.S. dollar at yearend.[2]

Peru's trade balance continued to be unfavorable; however, the mineral commodity portion continued to make a strong and increasingly positive contribution. Capital inflows from both official and private sources continued at about the previous year's high, but they were not enough to offset the deficits in the trade and service sectors of the economy.

At yearend, efforts were underway to improve the Government's fiscal position by restraining expenditures, improving collection of taxes, instituting an additional export tax for revenue (despite opposition from exporters), and re-instituting certain exchange controls. As the year closed, however, no new, large mining capital commitments had been made, as investors awaited clarification of the mining and petroleum industrial investment situation.[3]

Indicators of the general economic progress of Peru are tabulated as follows:

		1965 [1]	1966 [1]	1967 [p] [1]
Gross national product (GNP) at current prices	millions	$4,281	$5,091	$5,883
Population	do	11.7	12.0	12.4
GNP per capita		$366	$424	$474
Cost of living index (1966 = 100)		94.2	101.5	122.6
Commodity trade:				
Exports f.o.b	millions	$667	$764	$757
Imports c.i.f	do	$729	$816	$819
Trade balance	do	−$62	−$52	−$62
Total mineral production	do	$426	$477	$431
Mineral production as percentage of GNP		10.0	9.4	7.3

[p] Preliminary.
[1] U.S. Embassy, Lima, Peru. State Department Airgram A-548, Semiannual Economic Trends Report, unclassified portion, Mar. 24, 1968, 2 pp.

The value of total mineral production declined, expressed both in dollars and in percentage of the GNP. This was a reflection of the lower unit values of antimony, copper, lead, selenium, and zinc although unit values of cadmium, manganese, mercury, and silver increased. A tabulation of the principal value within the mineral industry by commodity for 1967 follows:

[1] Foreign minerals specialist, Division of International Activities.
[2] U.S. Embassy, Lima, Peru. State Department Airgram A-523, March 15, 1968, 1 p; enc. 3 pp. Exchange rate for 1967 is given as 26.82 soles per dollar for January–August, 36.64 soles for September, 38.71 soles for October, and 38.70 soles for November–December. Reported sol values are converted at the weighted average rate of 30.61 soles per dollar.
[3] U.S. Embassy, Lima, Peru. State Department Airgram A-116, Sept. 3, 1967, 1 pp. Enc. 7 pp.

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Commodity	Value (thousands)	Percent of mineral production value
Metals:		
Antimony	$296.0	0.1
Arsenic oxide	9.5	(1)
Bismuth	5,464.9	1.3
Cadmium	1,006.3	.2
Copper	150,095.4	34.8
Gold	2,822.5	.7
Indium	1.1	(1)
Iron ores	48,300.2	11.2
Lead	30,520.0	7.1
Manganese	191.6	(1)
Mercury	1,196.2	.3
Molybdenum	4,013.1	.9
Selenium	2.2	(1)
Silver	40,770.5	9.4
Tellurium	255.9	(1)
Thallium	.6	(1)
Tin	330.5	.1
Tungsten	1,225.0	.3
Zinc	41,447.3	9.6
Total	327,948.8	76.0
Nonmetals:		
Barite	879.1	0.2
Bentonite	81.7	(1)
Cement	28,400.0	6.6
Guano	3,064.4	.7
Salt	2,356.1	.6
Sand and gravel	1,143.0	.3
Other	3,019.3	.7
Total	38,943.6	9.1
Fuels:		
Coal	3,044.6	0.7
Coke	2,443.0	.5
Petroleum, crude	59,000.0	13.7
Total	64,487.6	14.9
Grand total	431,380.0	100.0

[1] Insignificant.

A number of laws passed since 1965 have had considerable bearing on Peru's mineral industry and will continue to influence it. Some of the more important laws follow in chronological order together with their identification and description.

Supreme Decree 70–F, December 29, 1965, provided that depletion allowances be reinvested in the mineral industry of Peru at the rate of 5 percent per year of accumulated depletion allowance for the first 5 years after the enactment of the regulations and at the rate of 10 percent per year thereafter.[4]

Law 16066, February 18, 1966, was wider in scope than Law 15584, June 1965, which it modified. It provided for increased land rentals for various metal, mineral, and other concessions. Annual rents were increased from 1.50 to 4.50 soles per hectare for gold concessions and from 100 to 250 soles per hectare for tunnel and concentrator concessions. This law also provided that a concessionaire's surface rentals would double annually if he was not producing from his concession in a quantity related to the reserves of that concession within 5 years of the law's enactment. Finally, it provided that, if a concession lapsed through lack of payment, it would be open to claim in accordance with the normal regime of the Mining Code.[5]

Supreme Decree 127-H, May 1966, revised the Mining Code; it required that the long–established 4–percent export tax be calculated on the London Metal Exchange price rather than the export refinery price[6] as reported in the Metals Week.

Supreme Decree 32-F, May 10, 1966, indicated that mining denouncements were to be suspended for 1 year in four zones of the country where the National Geologic Map Commission (Comisión Carta Geológica Nacional) had initiated a survey of mineral deposits. The zones which varied in size were in the Departments of La Libertad, Ica, Arequipa, and Tacna.[7]

Effective January 1, 1967, Article 184 of the 1966 Tax Code provided that mining companys' books be kept in terms of soles and that for depreciation purposes, capital assets be valued in soles at the rate prevailing when the assets were acquired. This had the effect of reducing the amount of depreciation chargeable against income in terms of equivalent dollars.[8]

The Peruvian National Service of Geology and Mining was established in January 1967 by merging the National Geological Map Commission and the National Institute of Mining Investigation and Promotion (Instituto Nacional de Investigación y Fomento Mineros) (INIFM). It was to be under the control of the Department of Mines within the Ministry of Development.[9]

[4] U.S. Embassy, Lima, Peru. State Department Airgram A-745, June 23, 1966, 20 pp.; Enc. 9 pp.

[5] U.S. Embassy, Lima, Peru. State Department Airgram A–760, June 9, 1967, 26 pp.; Enc. 10 pp.
Peruvian Mining Code, Law 11357, as amended by Law 16066.

[6] Sources cited in footnote 5.

[7] U.S. Embassy, Lima, Peru. State Department Airgram A–692, June 8, 1966. 1 p.; Enc. 4 pp.

[8] U.S. Embassy, Lima, Peru. State Department Airgram A–562, Mar. 23, 1967, 12 pp.; Enc. 2 pp.

[9] U.S. Embassy, Lima, Peru. State Department Airgram A–876, Jan. 10, 1967, 1 p.

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Law 16674, July 26, 1967, provided that the La Brea and Pariñas oilfields (the focal point of the long standing dispute between the Peruvian Government and the International Petroleum Co.) belong to the State, that they constitute areas of national petroleum reserve, and that, with respect to exploitation of the fields, the Executive power would establish the regime most advantageous for the national interest.[10]

Supreme Decree 61–F was dated July 31, 1967, and in the light of the aforementioned Law (No. 16674), continued toward solving the question of national petroleum reserves and how best to establish a policy most advantageous to the national interest regarding their exploitation.[11]

Supreme Decree 252–H, October 17, 1967, approved an agreement for supplying crude petroleum to the new La Pampilla refinery which is owned and operated by the National Petroleum Enterprise (Empresa Petrolera Fiscal) (EPF). The Decree provided that Gulf Oil Corp. would sell crude oil to EPF in the amount that Peru's domestic production was insufficient for La Pampilla's requirements.[12]

The Peruvian Congress passed Law 16710 on November 9, 1967; it provided for a 10-percent ad valorem charge on the gross value of virtually all exports from November 10, 1967, through March 31, 1969. The charge, which is deductible in calculating current income taxes, is a prepayment in equal installments of income taxes for the years 1969 through 1976.[13]

Supreme Decree 71–F, promulgated November 10, 1967, strengthened the provisions of Decree 42–F which gave certain advantages to the Government's new La Pampilla refinery in the Peruvian petroleum products market. Article 2 provided that consumers of residual fuel oil must purchase the entire heavy fuel oil (Bunker C) production of La Pampilla before additional quantities can be imported.[14]

PRODUCTION

Outstanding value gains were registered in 1967 in the production of silver, zinc, molybdenum, guano, and limestone, but these were not sufficient to counter the losses in value sustained in copper, lead, salt, sand and gravel production; therefore, total mineral production value for 1967 was lower than in 1966.

Production statistics were obtained mainly from the Department of Mines (Dirección de Minería), and some of them may be revised when the Anuario de la Industria Minera del Perú—1967 is published.

Statistics on metals essentially represent the recoverable content in all forms. In calculating recoverable metal, the Peruvian Department of Mines reportedly deducts from the assayed metal content of ores and concentrates 5 percent for copper and lead; 10 percent for zinc, iron, manganese, molybdenum, and tungsten; and 35 percent for arsenic, bismuth, cadmium, and tin. These deductions are based on average recoverability experience.

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[10] Peruvian Times, An English translation of Law No. 16674, Lima, Peru, Aug. 4, 1967, p. 1.
[11] U.S. Embassy, Lima, Peru. State Department Airgram A–74, Aug. 13, 1967, 1 p; Enc. 3 pp.
[12] U.S. Embassy, Lima, Peru. State Department Airgram A–217, Oct. 20, 1967, 2 pp; Enc. 1 p.
[13] U.S. Embassy, Lima, Peru. State Department Airgram A–276 (unclassified paragraph), Nov. 19, 1967, 5 pp.
Cerro Corp. 1967 An. Rept. N. Y. Mar. 22, 1968, 16 pp.
[14] U.S. Embassy, Lima, Peru. State Department Airgram A–318, Dec. 7, 1967, 1 p; Enc. 4 pp.

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Table 1.—Peru: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Antimony content of—					
Refined bars	352	359	264	359	313
Antimonial lead bars	29	25	33	13	12
Total smelter products	381	384	297	372	325
Ore and concentrate for export	230	298	350	300	310
Total recoverable antimony	611	682	647	672	635
Arsenic oxide (white arsenic)	620	621	500	r 365	295
Bismuth content of—					
Refined metal kilograms	475,730	674,770	656,040	665,972	711,634
Bismuth-lead bars do	84,161	46,377	89,256	81,141	62,855
Total smelter products do	559,891	721,147	745,296	747,113	774,489
Concentrate for export do	4,550	17,542	62,335	12,327	21,135
Total recoverable bismuth kilograms	564,441	738,689	807,631	759,440	795,624
Cadmium content of—					
Refined bars do	173,359	197,105	214,590	200,465	150,781
Zinc concentrate for export kilograms	19,137	29,790	112,453	101,660	75,575
Total recoverable cadmium kilograms	192,496	226,895	327,043	r 302,125	226,356
Copper content of—					
Refined bars	36,913	37,811	40,461	37,974	35,010
Blister	118,295	114,246	118,161	113,102	121,701
Matte	2,285	---	---	---	---
Zinc-copper-aluminum bars	8	10	---	---	---
Total smelter products	157,501	152,067	158,622	151,076	156,711
Copper sulfate	468	668	583	658	660
Ore and concentrate for export	21,330	22,825	20,671	24,665	23,765
Cement copper for export	765	885	510	---	NA
Total recoverable copper	180,064	176,445	180,336	176,394	181,136
Gold content of—					
Refined bars troy ounces	43,680	38,227	37,391	33,372	36,170
Gold-silver bars do	7,604	8,984	7,102	6,918	5,787
Copper bars do	1,268	1,236	1,178	---	1,162
Total smelter products do	52,552	48,447	45,671	40,285	43,119
Placer gold e do	8,241	7,691	15,288	20,619	20,416
Ore and concentrate for export troy ounces	40,225	36,365	r 44,224	34,074	32,024
Total recoverable gold e do	101,018	92,503	105,183	94,978	95,559
Indium kilograms	---	---	---	541	160
Iron and steel:					
Iron ore and concentrate thousand tons	6,621	6,528	7,104	7,787	7,659
Pig iron do	29	27	r 120	r 128	29
Steel ingots and castings do	76	82	94	r 80	79
Lead content of—					
Refined bars	80,773	89,466	86,558	88,567	81,651
Antimonial-lead bars	298	227	189	141	95
Bismuth-lead bars	56	31	60	54	69
Total smelter products	81,127	89,724	86,807	88,762	81,815
Ore and concentrate for export	68,070	60,950	67,537	55,998	76,378
Total recoverable lead	149,197	150,674	154,344	144,760	158,193
Manganese ore, 45 percent manganese equivalent	518	372	990	r 793	1,073
Mercury 76-pound flasks	3,092	3,275	3,117	r 3,166	2,980
Molybdenum sulfide content of ores and concentrates	849	659	1,134	1,122	1,541
Molybdenum content, recoverable	r 509	395	r 680	r 673	924
Selenium, refined kilograms	8,977	7,619	8,602	5,956	4,810

See footnotes at end of table.

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Table 1.—Peru: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals—Continued					
Silver content of—					
Refined bars					
thousand troy ounces	19,081	20,604	19,460	18,042	18,125
Sterling bars, do	615	655	812	909	874
Gold-silver bars, do	479	334	65	162	NA
Copper bars, do	809	757	734	817	827
Matte, do	469	---	---	---	---
Total smelter products, do	21,453	22,350	21,071	19,930	19,826
Ore and concentrate for export, do	15,347	12,069	15,399	12,911	16,044
Total recoverable silver, do	r 36,800	34,419	36,470	32,841	35,870
Tellurium, refined, kilograms	12,081	21,209	16,350	17,987	14,828
Thallium, do	---	---	100	50	50
Tin content of ore and concentrate for export, long tons	21	36	49	37	68
Tungsten ores and concentrates, gross tonnage	426	547	600	717	NA
60 percent WO_3 equivalent	516	646	796	728	537
Recoverable WO_3 content	279	348	430	393	290
Zinc content of—					
Refined metal slabs	53,905	59,742	61,291	62,626	61,659
Powder	778	922	1,150	---	1,339
Zinc-copper-aluminum bars	865	1,039	---	---	NA
Total smelter products	55,548	61,703	62,441	62,626	62,998
Sulfate	168	217	491	824	354
Ore and concentrate for export	139,180	174,740	191,564	194,369	254,571
Total recoverable zinc	194,896	236,660	254,496	257,819	317,923
Nonmetals:					
Barite	124,790	125,420	110,771	116,645	110,000
Bentonite	371	603	5,020	1,663	17,000
Cement	754,056	813,445	1,016,831	r 1,068,711	1,042,259
Clays:					
Common	249,989	260,567	290,520	290,000	320,000
Refractory	9,271	10,006	9,493	8,500	5,233
Kaolin	53	330	390	417	---
Diatomite	2,479	2,593	r 2,471	r 1,580	3,736
Dolomite	567	1,500	2,204	2,942	4,800
Feldspar	220	850	941	478	2,500
Gypsum:					
Crude	52,112	50,036	r 76,330	63,840	65,000
Calcined	29,977	32,869	39,929	NA	NA
Lime	85,000	92,488	NA	NA	NA
Limestone, crude:					
For cement manufacture	1,174,353	1,287,303	e 1,320,000	e 1,389,000	NA
For lime manufacture	118,754	89,935	e 640,000	e 296,000	NA
For metallurgical fluxing	25,500	60,990			72,228
Total crude	1,318,607	1,438,228	1,960,000	1,685,000	1,900,000
Marble, dimension stone	756	1,133	1,549	1,000	NA
Phosphate, guano	187,188	205,099	169,897	55,505	64,891
Pyrophyllite	2,432	3,592	4,192	3,835	4,469
Salt	r 103,580	132,887	r 137,531	172,997	140,660
Sand and gravel, thousand tons	1,090	1,482	1,732	2,477	2,010
Slate	23	---	---	---	NA
Stone, crushed:					
Quartz and marble	334	300	500	---	NA
Silica	64,568	69,757	69,383	60,000	55,000
Total	64,902	70,057	69,883	60,000	NA
Sulfur, content of sulfuric acid (98.5 percent acid)	NA	NA	NA	NA	11,592
Talc	172	170	285	---	NA

See footnotes at end of table.

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Table 1.—Peru: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Mineral fuels:					
Anthracite	9,600	31,737	7,730	13,684	5,000
Bituminous coal	121,559	115,347	121,200	140,988	170,043
Coke	38,448	25,568	27,402	34,927	41,202
Natural gas—million cubic feet	r 50,889	r 58,681	r 63,652	r 58,720	56,904
Natural gas liquids thousand 42-gallon barrels	1,078	1,082	1,156	1,092	1,095
Petroleum:					
Crude—do	21,468	23,119	23,068	23,027	25,857
Refinery products:					
Aviation gasoline—do	48	46	54	34	34
Motor gasoline—do	5,443	6,089	5,980	6,893	7,294
Jet fuel—do	486	725	789	1,025	1,175
Kerosine—do	2,989	3,139	3,270	3,438	3,620
Distillate fuel oil—do	5,791	5,958	6,254	6,037	5,638
Residual fuel oil—do	4,531	5,042	5,431	5,773	6,154
Lubricants—do	60	80	84	81	76
Asphalt—do	93	129	198	234	(3)
Other—do	r 4	87	r 182	r 94	295
Total refinery products do	19,445	21,295	22,242	23,609	24,286

e Estimate. p Preliminary. r Revised. NA Not available.
1 Production of Sociedad Siderúrgica de Chimbote, S.A., only.
2 Sales.
3 Asphalts probably included in "Other" products.

TRADE

The five metallic minerals shown in the table of selected mineral product exports for 1965 to 1967 constituted over 92 percent of the value of all mineral products exported. The table reflects the considerably increased value per unit of the copper and silver exports, the lesser gain in iron unit value, and the marked reduction in unit values of exported lead and zinc.

Table 2.—Peru: Selected mineral products, exported (f.o.b.)

Mineral product (fine content)	1965 1		1966 1		1967 p 2	
	Metric tons	Value (millions)	Metric tons	Value (millions)	Metric tons	Value (millions)
Copper	179,848	$121	176,138	$186	196,823	$198
Iron	4,594,247	47	4,858,679	53	5,414,441	62
Lead	151,012	38	150,901	35	150,512	30
Silver	1,028	39	1,100	41	957	42
Zinc	267,707	36	282,153	34	301,388	36

p Preliminary.
1 Estadística del Comercio Exterior, 1966, Ministerio de Hacienda y Comercio, Superintendencia Nacional de Aduanas, Lima, Peru. Exchange rate for 1965 and 1966 given as 26.82 soles per dollar.
2 Work cited in text footnote 2.

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Mineral commodities represented approximately 50 percent of the value of all Peruvian exports during the years 1965–67, and mineral commodity imports amounted to only 11 percent of total imports as shown in the following table:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	$304	$667	45.58
1966	377	764	49.35
1967 p	400	757	52.84
Imports:			
1965	91	729	12.48
1966	74	816	9.07
1967 p	96	819	11.72
Trade balance:			
1965	+213	−62	XX
1966	+303	−52	XX
1967 p	+304	−62	XX

p Preliminary. XX Not applicable.

Total Peruvian imports were valued at $816 million in 1966 (the latest full year for determination of origins). The United States supplied approximately 40 percent of the imports. Data for 1967 through October indicated that the United States maintained its position, supplying during the period about 37 percent of the imports by value.

Table 3.—Peru: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Antimony:			
Gross weight:			
Ore	1,041	1,044	Argentina, 341; Brazil 209; India, 165.
Refined bars	217	300	Mainly to United States.
Content of—			
Ore	495	581	(1).
Refined bars	202	284	(1).
Bismuth, content of—			
Mixed bars [2]	80	82	(1).
Refined bars	662	663	United States 505; Netherlands 120.
Cadmium, content of—			
Concentrates	----------	39	(1).
Refined bars	223	212	Mainly to United States.
Copper:			
Gross weight:			
Ore and concentrate	87,976	90,167	Japan 39,522; United States 24,893; Sweden 14,451.
Cement and matte	1,151	858	United States 715; Japan 143.
Blister	118,165	121,724	Mainly to United States.
Copper alloys	----------	558	All to United States.
Content of—			
Ore and concentrates	23,865	23,128	(1).
Cement and matte	738	552	(1).
Blister	117,276	120,439	(1).
Refined bars and sheets	37,969	31,476	(1).
Mixed bars	----------	544	(1).
Total copper content	179,848	176,139	
Gold, content of—			
Ore, various troy ounces	1,300	2,252	(1).
Concentrate, various do	34,435	41,343	(1).
Mixed bars [2] do	657	1,407	(1).
Blister bars do	8,243	8,637	(1).
Total do	44,635	53,639	

See footnotes at end of table.

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Table 3.—Peru: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Iron and steel:			
Iron ore	6,374,948	6,307,415	Mainly to Japan.
Iron ore, concentrate	871,084	1,372,438	Japan 645,178; United States, 356,182.
Scrap, foundry, and waste	35	---	
Lead:			
Gross weight:			
Ore	3,423	9,990	United States 5,632; Japan 1,897.
Concentrate	115,285	115,862	United States, 65,507; West Germany 20,804; Japan 12,886.
Content of—			
Ore	3,906	4,687	(1).
Concentrate	61,652	59,385	(1).
Mixed bars [2]	53	56	(1).
Refined bars	85,401	86,775	United States 48,809; Netherlands 7,329.
Total lead content	151,012	150,903	
Manganese ore	471	---	
Mercury [3] 76-pound flasks	1,643	2,768	Netherlands 1,250; United States 1,128.
Molybdenum: Ore and concentrate	1,107	1,609	Belgium-Luxembourg 628; France 471.
Selenium, content of crude metal. kilograms	8,733	6,739	Mainly to United States.
Silver:			
Gross weight: Refined bars. thousand troy ounces	19,110	18,610	West Germany 9,240; United States 3,133.
Content of—			
Ores, of silver and other metals. do	419	354	(1).
Concentrate do	12,929	14,440	(1).
Copper cement and matte. do	1	---	
Blister bars do	783	1,613	(1).
Mixed bars [2] do	124	368	(1).
Refined bars do	18,788	18,595	(1).
Total silver content. do	33,044	35,370	
Tellurium, content of refined cakes and bars. kilograms	28,182	51,447	Mainly to United States.
Tin content of ores and concentrate. long tons	89	53	United Kingdom 34; United States 19
Tungsten ore and concentrates	632	672	United States 514; West Germany 140.
WO_3 content [4]	453	432	United States 348; West Germany 64.
Ores, 60 percent WO_3 equivalent	755	720	United States 580; West Germany 106.
Zinc:			
Gross weight:			
Ores	1,569	---	
Concentrates	398,481	429,810	Japan 226,160; United States 142,681.
Content of—			
Ores	864	---	
Concentrates	211,127	225,730	(1).
Refined bars, slabs, and sheets.	55,716	56,377	United States 28,490; Belgium-Luxembourg 12,839.
Total zinc content	267,707	282,107	
Mixed metals, ingots and bars, gross weights:			
Bismuth with lead and silver	133	118	All to United States.
Silver with gold troy ounces	133,426	369,734	Mainly to West Germany.
Nonmetals:			
Barite, crude	17,952	91,680	Mainly to United States.
Bentonite	27	46	All to Ecuador.
Cement	25	5,320	All to Bolivia.
Chalk	30	15	All to Ecuador.
Guano	2,150	2,100	United Kingdom 1,500; United States 600.
Salt	120	182	All to Ecuador.
Sand	50	---	
Stone: Ornamental porphyry, onyx, marble.	32	---	

See footnotes at end of table.

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Table 3.—Peru: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Mineral fuels:			
Anthracite	15,910	50	All to Bolivia.
Peat	56	---	
Petroleum:			
Crude	344,057	278,900	United Kingdom 140,844; Brazil 70,938.
Liquid petroleum gas	302	---	
Petroleum refinery products:			
Motor gasoline	6	368	Mainly to Colombia.
Kerosine	62	37	Chile 31; Colombia 5.
Distillate fuel oil	83,056	51,065	Mainly to Chile.
Residual fuel oil	41,228	39,392	Mainly to bunkers.
Lubricants	3,746	2,019	Mainly to Chile.
Other----kilograms	---	380	Mainly to bunkers.

[1] Country distribution not separately reported.
[2] See mixed metals listed at end of metals section of table for gross weights.
[3] Metal content of ores and concentrates.
[4] Official report of these figures as metal (W) content believed to be in error.

Table 4.—Peru: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys:			
Ingots	1,769	2,429	Canada 1,605; United States 764.
Semimanufactures	2,279	1,622	Belgium-Luxembourg 287; Austria 245; United Kingdom 242; United States 241.
Cadmium metal----kilograms	296	48	United Kingdom 35; United States 12.
Copper and alloys:			
Unalloyed, all forms	1,398	901	Sweden 155; West Germany 144; Chile 114; Japan 105.
Alloyed, all forms	51	59	United Kingdom 25; United States 11; Italy 11.
Gold:			
Bars----troy ounces	253,412	373	Mainly from West Germany.
Plates, sheets, foil, etc----do	218	---	
Iron and steel:			
Iron ore	74	---	
Iron and steel scrap	4,472	1,747	All from United States.
Powder, shot, and sponge	170	224	Mainly from Sweden.
Ferroalloys	1,065	1,477	Mainly from Republic of South Africa.
Semimanufactures:			
Bars, rods, and structural shapes.	35,915	34,464	Belgium-Luxembourg 13,796; United States 6,657; Japan 3,531; West Germany 2,427.
Rails and accessories	7,550	9,921	United Kingdom 5,700; West Germany 2,984.
Plates, sheets, strips, bands, and hoops:			
Uncoated	68,762	71,532	Japan 36,543; West Germany 13,352; United States 8,943; Belgium-Luxembourg 8,763.
Galvanized	12,488	6,244	Japan 2,888; United States 1,377; Belgium-Luxembourg 1,178.
Tinplate and terneplate	23,643	24,495	Japan 7,329; Canada 5,582; United States 4,403; France 3,872.
Wire	5,179	6,814	United States 2,009; Belgium-Luxembourg 1,457; United Kingdom 948; Japan 858.
Pipe and fittings	25,968	25,323	Japan 7,054; United States 5,869; Mexico 4,837; France 3,437.
Cast iron	410	---	
Lead and alloys, all forms	47	64	Mainly from United States.
Magnesium metal----kilograms	2,858	2,461	United States 1,607; Italy 762.
Mercury----76-pound flasks	31	16	United States 10; Japan 4.
Nickel and alloys, all forms	47	70	West Germany 27; United States 19; Norway 10.
Platinum and platinum group metals. troy ounces	79	567	Mainly from Switzerland.

See footnotes at end of table.

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Table 4.—Peru: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Silver ingots, dust, sheets, etc.—troy ounces	8,231	9,099	Mainly from United States.
Tin and alloys:			
Refined unalloyed—long tons	105	142	Malaysia 57; United Kingdom 36; Denmark 24.
Bar, sheet, powder, and pipe.—do	18	12	Mainly from United States.
Babbitt—do	5	8	Do.
Other alloys, solder—do	112	39	Do.
Zinc:			
Refined ingots, bars, scrap	46	59	Do.
Plates, lithographic; bands; rods; strips.	157	155	Belgium-Luxembourg 82; West Germany 20; United States 19.
Granular	31	73	Japan 38; United Kingdom 29.
Other:			
Ores of ferroalloying metals	1,263	1,200	Mainly from Philippines.
Nonferrous ores, scorias, not elsewhere specified.	828	1,603	Mainly from Guyana.
Nonferrous base metals and alloys, not elsewhere specified.	13	5	Mainly from United States.
Nonmetals:			
Abrasives, natural	3,715	3,695	United States 1,799; West Germany 1,626.
Asbestos, crude, refined, or washed	4,535	3,533	Mainly from Canada.
Cement:			
Portland	57,823	154,739	Venezuela 52,345; Poland 31,944; Japan 20,321.
White (for stucco)	2,506	2,558	Japan 867; Denmark 475; France 420.
Chalk	1,535	2,071	France 1,519; Belgium-Luxembourg 541.
Clays:			
Bentonite	871	805	Mainly from United States.
Kaolin and refractory earth	1,218	1,628	Do.
Other	2,127	680	United States 368; United Kingdom 150.
Cryolite	3	(1)	All from United States.
Feldspar	252	202	Mainly from Canada.
Fertilizers and fertilizer raw materials:			
Nitrogenous:			
Anhydrous ammonia	23	28	All from United States.
Potassium nitrate	159	143	Mainly from West Germany.
Sodium nitrate	1,895	2,455	Mainly from Chile.
Other nitrogen fertilizers	111,596	64,404	West Germany 24,719; United States 11,177; Belgium-Luxembourg 10,812.
Phosphatic:			
Phosphate rock	19,318	(1)	All from United States.
Phosphatic fertilizers	221	224	Mainly from United States.
Potassic, all forms	6,769	4,486	France 1,997; West Germany 1,834.
Other	6,425	6,220	Chile 3,839; West Germany 1,606; United States 768.
Graphite: Crude	79	73	United Kingdom 32; Norway 15; West Germany 11.
Gypsum, calcined	102	204	Mainly from United States.
Magnesite, crude or calcined	1,206	1,273	Do.
Mica, all forms	119	134	Do.
Quartz	172	21	West Germany 11; United States 5.
Salt, crude	4,325	2,687	Mainly from Bahama Islands.
Sands, silica or other	r2,723	2,248	Mainly from United States.
Stone, ornamental and construction	555	803	Mainly from Italy.
Sulfur, all forms	16,002	13,248	Mainly from United States.
Talc and steatite	970	807	United States 295; Italy 222; Norway 89.
Witherite (barium carbonate), crude	90	98	Mainly from United Kingdom.
Other nonmetals	410	705	Canada 350; Republic of South Africa 173; United States 140.
Mineral fuels:			
Coal and briquets	1,127	10	Mainly from Colombia.
Peat	7	5	All from United States.
Coke	8,106	4,446	Mainly from West Germany.
Other	20	45	Mainly from United States.
Petroleum:			
Crude and partially refined	76,750	125,467	Mainly from Venezuela.

See footnote at end of table.

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Table 4.—Peru: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Mineral fuels—Continued			
Petroleum—Continued			
Refinery products:			
Aviation gasoline	43,566	41,181	Mainly from Netherlands Antilles.
Motor gasoline	158,010	243,354	Do.
Kerosine	510	-------	
Distillate fuel oil	478,283	635,957	Venezuela 329,816; Colombia 190,316.
Lubricants, including greases	121,251	147,618	Venezuela 82,518; Netherlands Antilles 35,894; United States 25,191.
Asphalt	1,196	981	Mainly from United States.
Vaseline, paraffin, waxes	12,741	11,919	India 6,012; United States 3,247 Japan 1,864.
Other	1,470	1,348	Mainly from United States.
Total refinery products	817,027	1,082,358	

r Revised.
1 Less than ½ unit.

COMMODITY REVIEW

METALS

Copper.—Southern Peru Copper Corp. (SPCC) had a record high blister copper output in 1967, producing approximately 11 percent more than in 1966. In addition, SPCC reportedly sold from stocks copper concentrates containing 7,348 metric tons of copper. Salient company data for the years 1965 to 1967 follow:

	1965	1966	1967
Ore and waste mined—metric tons	51,790,000	51,686,865	58,939,809
Ore mined—do	10,166,766	11,503,106	12,296,893
Ore-to-waste ratio	1:4.1	1:3.5	1:3.8
Copper content of—			
Milled ore—percent	1.29	1.22	1.18
Blister copper recovered at Ilo smelter—metric tons	119,100	113,980	126,507

A pilot mill was installed at Toquepala for testing ore from the nearby Cuajone orebody which is estimated to contain some 530 million tons of 1-percent-copper ore.

During 1967 rail haulage was installed on the lower levels of the Toquepala mine while ten 85-ton pit-haulage trucks were acquired for moving waste from the mine's upper levels.

Copper production by the Cerro de Pasco Corp. (Cerro-Peru), a Cerro Corp. subsidiary, was slightly lower in 1967 than in 1966. Cerro-Peru, the country's second largest copper producer, reported that output was adversely affected by a 1-week mineworkers' strike and a 2-week strike by metallurgical workers.

Cerro-Peru reported that a 750-ton-per-day concentrator had been put into operation at their Yauricocha property in April 1966, completing the conversion of the property from a direct smelting copper ore producer to a broader-based copper-lead-zinc-silver mine.

Production was started at Cerro-Peru's new Cobriza property in December 1967. This copper property, about 185 kilometers southeast of La Oroya in the Department of Huancavelica was producing about 1,000 tons of ore daily in early 1968. Estimates call for an annual production of about 9,100 tons of recoverable copper. Cobriza is an underground mine with a mill located on the property. The concentrates are shipped to La Oroya for reduction. To accommodate the Cobriza production, additional electrolytic copper refining equipment reportedly was being installed at La Oroya and was expected to be ready by late 1968. The new equipment was expected to increase the annual capacity from 40,000 to about 51,000 tons of refined copper.

Another Cerro Corp. subsidiary operating in Peru, Compañía Industrial del

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Centro, S. A. (CIDECSA) substantially completed construction of a 50,000-ton annual capacity copper wire rod hot-rolling mill at La Oroya by the middle of 1967, along with a sulfuric acid plant designed to have a capacity of 200 tons per day.

Iron Ore.—The Marcona Mining Co. continued to mine iron ore on the Peruvian coast about 320 kilometers south of Lima and to ship products from two ocean ports, San Nicolas and San Juan. Operating subsidiaries of the Marcona Corp. and their functions were as follows: The Marcona Mining Co., mining; Cía. San Juan, S. A., oremarketing; and San Juan Carriers, Ltd., ocean transport. Between 1965 and 1967, the Marcona Mining Co. increased sales of iron ore products some 12 percent and since their pelletizing facilities were brought into full operation during that time, sales of pelletized products increased about 225 percent. Sales of iron ore products for the years 1965 to 1967 were reported as follows:

	Thousand metric tons		
	1965	1966	1967
Unbeneficiated	1,890	1,592	1,627
Beneficiated:			
Pellets	955	1,633	3,103
Other	3,963	3,927	2,902
Subtotal	4,918	5,560	6,005
Total	6,808	7,152	7,632

During 1967, Marcona completed an 18-kilometer mine-to-port belt conveyor system, acquired three 15-cubic-yard electric shovel ore loaders and eighteen 100-ton-capacity diesel electric pit haulage trucks.

Iron and Steel.[15]—Peru's first blast furnace went into operation on December 15, 1967. The furnace, 5 meters in diameter and 27 meters in height, was expected to produce 500 tons of pig iron per day or 200,000 tons per year. It was part of the lastest expansion program at the Chimbote plant of Sociedad Siderúrgica de Chimbote, S. A. (SOGESA), which is now nearing completion and which represents a $78 million investment. SOGESA, owned and operated by a State corporation, Corporación Peruana del Santa, is the nation's only integrated steel plant. Other equipment added in this expansion have been two Linz-Donawitz converters, a continuous casting plant, an oxygen plant, and a new pier. It was recently announced that SOGESA will be further expanded by the addition of a new rolling mill at a projected cost of some $67 million.

The 1966 output of major products from the SOGESA plant were as follows (figures in parentheses are 1965 output): pig iron, 27,655 tons (19,934); ingot steel, 57,373 (81,405); and merchant bars, 68,419 (73,723). Raw materials consumed in 1966 included iron ore, 18,800; scrap iron, 53,495; coke, 4,702; ferromanganese, 310; and ferrosilicon, 47.

Of the other smaller steel companies in Peru, the largest was Metalúrgica Peruana, S. A. (MEPSA), near Lima. Owned principally by large mining companies, Cerro de Pasco Corp., Southern Peru Copper Corp., and others, it produces grinding balls and ball mill liners using scrap provided by the mining companies. MEPSA has one pot furnace with a capacity of 4 tons per hour and two electric steel furnaces of 5-tons capacity each. The plant can produce 15,000 tons per year.

Other small plants included Fundición Callao, S. A. (one pot furnace and two electric furnaces), Industria Nacional de Productos del Acero, S. A. (PRODAC) (wire production), Industria Peruana de Alambre, S. A. (ALAMBRESA) (wire and galvanized plate production), and Electrometalúrgica Nacional, S. A. (ENSA) (ferromanganese production with 3,600 tons annual capacity). Two new companies, Aceras Lima and Aceras Arequipa, were recently formed to manufacture beams using SOGESA products as raw materials.

Lead and Zinc.—During 1967, Northern Peru Mining Corp., a wholly owned subsidiary of the American Smelting and Refining Co., increased the capacity of their Quiruvilca mill by 50 percent by the installation of additional circuits to recover lead and zinc concentrates in addition to the existing copper circuit.

It was also reported that the Chilete lead-zinc mine which has nearly depleted

[15] Sources: U.S. Embassy, Lima, Peru. State Department Airgram A-369, Dec. 29, 1967. 1 p.; State Department Airgram A-772, June 13, 1967, 8 pp.; Enc. 6 pp.; Revista Latinoamericana de Siderurgia, ILAFA, No. 87, July 1967, pp. 19–20.

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its reserves will be closed in the second quarter of 1968.

Compañía Minerales Santander, Inc., Peru, the wholly owned subsidiary of the St. Joseph Lead Co. of New York, continued developing its underground lead and zinc mine in central Peru, Department of Lima, in 1967. Upon completion of the new shaft started in 1966, the existing open pit mine will be phased out; this is projected for the fourth quarter of 1968. Zinc concentrate tonnage reportedly increased slightly in 1967 over that of the previous year, but lead concentrate decreased due to the reduced lead content of ore mined.

MINERAL FUELS

Petroleum.—Peruvian crude petroleum production in 1967 registered a 12.3 percent increase over that of 1966, largely as a result of increased development of the Belco Petroleum Corp. offshore concessions near Talara.

Table 5.—Peru: Distribution of crude petroleum production by zone and company
(Thousand 42-gallon barrels)

Zone and company	Production	
	1966	1967 p
Continental Shelf:		
Belco Petroleum Corp. of Peru	1,384	8,517
Cabeen Exploration Co	370	957
Empresa Petrolera Fiscal	4	358
Total	1,758	4,832
Coastal:		
Belco Petroleum Corp. of Peru	102	81
Empresa Petrolera Fiscal	2,435	1,984
International Petroleum Co., Ltd., Lobitos [1]	10,883	10,798
International Petroleum Co., Ltd., La Brea y Pariñas	6,715	6,974
Petrolera Amotape, S.A	11	10
Total	20,146	19,847
Eastern:		
Compañía Peruana de Petróleo "El Oriente", S.A	551	591
Compañía de Petróleo "Ganso Azul", Ltda	572	587
Total	1,123	1,178
Grand total	23,027	25,857

p Preliminary.
[1] Concession jointly held with Compañía Petrolera Lobitos (Burmah Oil Co., Ltd.) but operated by International Petroleum Co., Ltd.

Exports of crude oil and petroleum products increased markedly in 1967 compared with those of 1966; however, imports, due in part to increased production and in part to the September currency devaluation and restriction of imports, increased only about 1 per cent in 1967. A comparative trade table for the years 1966 and 1967 follows:

Product	Thousand 42-gallon barrels	
	1966	1967
Imports:		
Crude oil	728	1,170
Aviation gasoline	405	315
Motor gas and naphtha	3,097	3,010
Distillate fuel oil	366	317
Residual fuel oil	3,925	3,757
Lubricants	172	85
Others	73	204
Total	[1] 8,769	8,858
Exports:		
Crude oil	1,985	3,690
Distillate fuel oil	656	680
Lubricants	13	5
Others	2	6
Total	2,656	4,381

[1] Detail does not add to total due to rounding.

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Consumption of refined petroleum products increased approximately 5.5 percent in 1967 over the previous year. With the exception of aviation gasolines, all the regular products showed increases in consumption ranging from 17.8 percent for turbo fuel to 2.3 percent for residual fuel oil. A table of domestic consumption of refined petroleum products for the years 1966 and 1967 follows:

Product	Thousand 42-gallon barrels	
	1966	1967
Crude oil	243	------
Aviation gasoline	388	382
Motor gasoline	8,998	9,878
Turbo fuel	955	1,125
Kerosine	3,519	3,774
Distillate fuel oil	5,690	5,906
Residual fuel oil	9,314	9,525
Others	1,110	1,295
Total	30,217	31,885

The La Pampilla refinery, owned and operated by the Peruvian Government organ, Empresa Petrolera Fiscal (EPF), was officially opened December 17, 1967. It had been operating about a month, treating Venezuelan crude at a rate of 10,000 barrels per day supplied under contract by the Gulf Oil Corp. The refinery has a rated daily capacity of 20,000 barrels but has operated at an average of about 16,000 barrels. The refinery is capable of producing 95-octane gasoline in addition to the lower grades of gasoline, the normal grades of kerosine, jet fuel, diesel oil, and bunker fuel. When the refinery is operating at capacity, it is projected that crude oil requirements in excess of the quantities delivered by Gulf will be supplied by EPF's production facilities at Los Organos and by Belco Petroleum Corp. offshore operations at Talara.

Petroleum exploration activities increased from 54.9 party months in 1966 to 73.5 party months in 1967, while 50 wildcat wells were drilled compared with 24 drilled in 1966. Twenty-four of the exploratory wells were dry, a success ratio of 52 percent for all exploratory drilling.

Plans for development of natural gas resources in Peru suffered reverses in 1967 as the Aguaytía Group's drilling program produced two dry exploration holes and one gas producing hole near Pucallpa in eastern Peru. The Aguaytía Group, formed in 1966 to develop natural gas previously discovered, consisted of (1) Cía. Peruana de Petróleo "El Oriente" S.A., (2) Cerro de Pasco Petroleum Corp., (3) Deutsche Erdoel A.G. Gewerkschaft Elwerath and Wintershall A.G., (4) Peruvian Oils & Minerals, Ltd., and (5) Mobil Oil Co. del Peru.

The original discovery well, Aguaytía-1, had been drilled in 1962 about 80 kilometers west of Pucallpa. The two dry holes, Pisqui-1 and Tahuaya-1, were drilled as exploration wells in structures adjacent to the Aguaytía. In November 1967, Aguaytía-2 was completed as a shut-in gas/condensate producer, and an economic assessment of the Aguaytía structure was considered.

Due to the two dry holes, the plan to pipe natural gas over the Andes to the Lima-Callao area appeared unlikely, because no additional reserves were generated to justify the lengthly pipeline. However, it was hoped that the Aguaytía structure would contain sufficient reserves to warrant the investment to pipe gas to La Oroya for use in the Cerro de Pasco smelter operation.

The long-time dispute between the International Petroleum Co. and the Peruvian Government continued throughout the year. Despite the number of laws and decrees promulgated relating to and associated with the disputed La Brea y Pariñas property and environs, as the year ended the situation was still uncertain, and the successful completion of negotiations was not in sight.

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The Mineral Industry of the Philippines

By Arnold M. Lansche [1] and K. P. Wang [2]

During 1967, the Philippine gross national product (GNP) rose about 10 percent and mineral output increased perhaps 10 to 15 percent from the reported $186 million in 1966. Mineral-output value (excluding value added) was equivalent to nearly 3.4 percent of the $6.3 billion GNP. Copper, gold, chromite, iron ore, cement, and refinery products were still the major commodities in 1967, with copper holding a dominant position. Base metal ores, virtually all exported and mainly to Japan, earned significant amounts in foreign exchange. Copper exports alone may have reached nearly $100 million in 1967. Output of cement, iron and steel, fertilizers, and petroleum products from imported crude oil was primarily for domestic markets.

Much mineral exploration took place, particularly for copper and sulfur. Several developing copper prospects reaffirmed the potential of the Philippines for nonferrous base metals, and associated pyrite has proven to be abundant. Extensive exploratory drilling was done on a sulfur property in Negros Oriental.

High prices and the long strike in the United States spurred copper output to a new high. Greater world demand and a Government subsidy stimulated the expansion of gold-producing facilities. The leading producer of metallurgical chromite had a good year, but output of the only producer of refractory chromite fell. Philippine iron ore producers found difficult competition with Australia in supplying the Japanese market. The construction boom boosted cement production greatly, and petroleum refining and consumption continued to expand on a moderate scale.

Discussions between the Philippines and the United States were started, in November 1967, on the subject of a new trade agreement to replace the Laurel Langley Trade Agreement that expires July 3, 1974.

Pesos at 3.90 to $1 were freely convertible, and imports did not require import or foreign exchange licenses after mid-1967. The Philippine President's Administrative Order No. 21 of September 6, 1966, which liberalized repatriation of investment, remittance of earnings, payments of foreign loans, and servicing of foreign obligations, was actively implemented in 1967. The Corporation Law was amended by Republic Act 5167, approved August 4, 1967, to permit domestic or foreign mining corporations to own as much as 40 percent of another mining company.

PRODUCTION

The 12.5-percent tonnage increase in copper and the 30-percent increase in cement production were main contributions to the overall rise in mineral-output value over that of 1966. Gold showed little change, although groundwork had been done to boost production. Pyrite output increased sharply to meet the needs for fertilizer manufacture.

The additional copper in 1967 came mainly from existing enterprises. Thus, when some new mines come into operation in a few years, the Philippines will be able to top the 100,000-metric-ton annual out-

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put mark. Output of direct-shipping iron ore declined, while that of concentrates and pellets increased; some beach sands were also produced. Zinc came mainly from the Tuba gold-zinc mine near Baguio and the Bagacay copper-zinc mine. Byproduct cadmium was produced from zinc, and byproduct molybdenite from copper from the Sipalay mine.

Information on mineral output value by commodity is only available for 1966, and excludes value added. The main product, copper in concentrates, contributed 44 percent to total output. Cement ranked next with 19 percent, followed by gold with 12 percent, iron ore with 8 percent, sand and gravel with 6 percent, and refractory chromite with 5 percent. Salt contributed 2 percent, metallurgical chromite 1 percent and silver, manganese, mercury, zinc, and coal, less than 1 percent each. The value added was sizable for petroleum but of lesser importance for steel products.

Table 1.—Philippines: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Cadmium, content of zinc concentrate kilograms	11,200	11,000	r 9,570	r 5,440	3,000
Chromite:					
Metallurgical thousand tons	86	r 86	96	104	133
Refractory do	373	r 382	458	456	287
Total do	459	r 468	554	560	420
Copper, metal content of concentrates (largely 22 to 29.5 percent copper)	63,686	60,458	62,740	r 73,758	83,763
Gold troy ounces	376,006	425,770	435,545	453,546	500,417
Iron and steel:					
Iron ore and concentrate, 55 to 58 percent iron thousand tons	1,385	1,367	1,438	r 1,475	1,506
Ferroalloys	1,296	1,532	1,744	1,795	718
Steel ingots (from scrap) e thousand tons	NA	NA	[1] 114	[1] 148	NA
Lead, metal content of 50 to 60 percent concentrate	71	103	105	92	95
Manganese ore	7,666	8,005	51,744	56,093	86,488
Mercury, estimated content of concentrate 76-pound flasks	2,651	2,496	2,384	2,443	2,612
Molybdenum, metal content of 94 percent MoS_2 concentrate	107	105	77	49	41
Silver troy ounces	838,304	907,504	932,944	1,162,889	1,396,268
Zinc, content of concentrate	3,893	2,136	2,059	r 1,648	1,548
Nonmetals:					
Asbestos	382	532	-----	500	58
Asphalt rock	5,186	-----	-----	-----	NA
Barite, 85 to 90 percent $BaSO_4$	914	1,476	-----	2	NA
Cement thousand tons	951	1,201	r 1,529	r 1,613	2,112
Clays, white	6,703	6,967	e 7,000	e 6,000	e 6,000
Dolomite	5,089	5,220	5,149	4,135	6,794
Feldspar	6,669	8,051	12,289	8,615	NA
Gypsum (mostly byproduct)	30,694	40,958	27,488	r 15,329	15,184
Lime	31,396	29,175	23,831	23,548	84,342
Limestone thousand tons	1,480	1,799	2,300	2,400	3,000
Phosphatic materials:					
Guano	1,473	1,191	4,172	534	1,316
Phosphate rock	1,066	2,857	10	100	1
Pyrite	58,055	43,912	105,293	114,442	146,219
Salt, sea thousand tons	70	47	r 255	r 183	116
Silica sand (ordinary glass sand) do	111	r 197	280	234	311
Sulfur	48	69	r 48	14	24
Talc	95	98	593	637	444
Mineral fuels:					
Coal thousand tons	157	115	95	r 75	65
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	8,660	9,189	9,474	11,213	12,448
Kerosine [2] do	2,509	2,544	3,238	3,803	2,863
Distillate fuel oil do	5,872	6,881	7,139	8,450	9,425
Residual fuel oil do	7,561	9,757	11,093	13,133	16,607
Refinery fuel (including losses) do	1,374	1,500	1,700	r 2,333	e 2,964
Other products do	1,545	954	e 1,442	1,801	1,356
Total	27,521	30,825	34,086	40,733	45,663

e Estimate. r Revised. p Preliminary. NA Not available.
[1] Rolled steel.
[2] Includes jet fuel.

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TRADE

Complete trade data for 1966 and 1967 are not available. However, preliminary information for the first half of 1967 shows that total exports were valued at $386 million (down $45 million compared with the same period in 1966 and total imports at $511 million (up $118 million). Mineral exports did increase, however, by 10 percent or more. Production of copper concentrates greatly increased, and exports of this, the Philippines' foremost export product, presumably rose correspondingly. Iron ore exports remained steady. The principal mineral import item was petroleum. Even though tonnage went up only slightly, value increased considerably because of the Middle East crisis.

Overall 1966 Philippine trade was valued at about $1.75 billion. Imports and exports were fairly balanced, and the two main trading partners were the United States and Japan. Exports of metalliferous ores and metal scrap in 1966 totaled about $120 million, or nearly 14 percent of all exports. Imports of base metals and mineral fuels each were valued at about $90 million, or nearly 10 percent of total imports. Although overall trade value increased by 7 to 8 percent over that of 1965, the trade pattern did not change appreciably.

Japan took virtually all mine copper (except the gold-copper ores of Lepanto Consolidated which went to Takoma, Wash.), metallurgical chromite, and iron ore. The bulk of refractory chromite, gold, and zinc concentrate went to the United States.

Lacking oil, the Philippines imported crude petroleum from Indonesia, Iran, Iraq, Kuwait, Qatar, Sarawak, and Saudi Arabia. Japan and the United States supplied most of the metal ingots and semimanufactures, refined petroleum products, and fertilizers.

Table 2.—Philippines: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal destinations, 1965
Metals:			
Brass scrap	1,137	925	Japan 885; Taiwan 40.
Chromite:			
Metallurgical	130,230	105,840	All to Japan.
Refractory	457,094	512,964	United States 331,874; United Kingdom 84,520.
Copper:			
Ore	16,804	22,316	All to Japan.
High-gold concentrate	46,148	235,416	Do.
Ordinary concentrate	269,432		
Metal content of ore and concentrate[e]	63,400	47,000	Do.
Scrap	1,208	1,215	Japan 375; West Germany 340.
Gold:			
Bullion, troy ounces	240,242	40,565	All to United States.
Concentrate and matte[1]	6,784	2,827	Japan 2,160; United States 667.
Iron ore and equivlent:			
Ore, thousand tons	1,311	1,272	All to Japan.
Concentrate, do	204	117	Mainly to Japan.
Manganese ore	16,537	59,988	Japan 53,538.
Mercury, 76-pound flasks	1,447	2,205	Netherlands 858; United Kingdom 449.
Molybdenum concentrate	275	150	West Germany 71; United Kingdom 40.
Zinc ore and concentrate	4,888	3,910	All to United States.
Mineral fuels:			
Crude oil (reexport), thousand tons	18	4	All to South Viet-Nam.
Gas oil (bunker fuel), do	48	46	Mainly to Malaya.

[e] Estimate.
[1] Includes gold-and-silver bearing lead-copper concentrates.
Source: Department of Commerce and Industry, Bureau of the Census and Statistics. Foreign Trade Statistics of the Philippines 1964 and 1965, Manila, 1965 and 1966.

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Table 3.—Philippines: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal sources, 1965
Metals and metallic ores:			
Aluminum:			
Ingots, bars, and alloys	4,460	4,283	United States 2,319; Canada 859.
Semimanufactures	950	940	Japan 372; United States 255.
Copper:			
Ingots and bars	3,400	3,970	Japan 3,907.
Semimanufactures	1,320	1,035	Japan 526; United States 168.
Iron and steel:			
Pig iron	21,150	14,555	Japan 6,909; Australia 3,742; Spain 3,048.
Ferroalloys	1,991	1,451	Taiwan 670; Norway 483; Japan 192.
Ingots and semimanufactures thousand tons	• 500	530	Japan 360.
Scrap	10,182	10,999	United States 10,022.
Lead:			
Ingots, bars, and alloys	2,003	3,052	Australia 2,585; Japan 182.
Semimanufactures	428	595	Australia 155; Japan 96; United States 70.
Pigments	• 704	485	United States 235; Australia 219.
Nickel, all forms	65	33	United States 26.
Tin ingots and alloys long tons	4,600	600	Malaysia 592.
Titanium oxide	2,295	2,361	Japan 765; West Germany 381; Australia 374; United Kingdom 317; Belgium 134.
Zinc:			
Ingots and alloys	10,363	10,958	Australia 4,711; Japan 3,593.
Semimanufactures	2,290	538	Australia 249; United States 121.
Pigments	1,100	792	Netherlands 431; United Kingdom 104.
Nonmetals:			
Abrasive, including diamond	333	347	Netherlands 144; United States 98.
Asbestos	1,894	1,288	Canada 750; Portuguese Africa 181.
Cement	185,851	91,547	Taiwan 62,843; Japan 24,305.
China clay	2,857	4,233	Japan 2,120; United Kingdom 1,084.
Diatomaceous earth	2,382	4,239	Japan 4,010.
Dolomite	2,699	3,277	Japan 2,426; United States 441.
Fertilizers, chemical thousand tons	234	226	Japan 85; West Germany 55.
Gypsum	27,581	25,935	Cyprus Island 10,450.
Phosphate rock	18,754	57,797	United States 57,792.
Sulfur	5,212	19,039	Canada 16,386; United States 2,351.
Talc	2,572	2,652	South Korea 1,447; Japan 594.
Mineral fuels:			
Coke from coal	11,521	20,699	Australia 7,627; Taiwan 5,910.
Petroleum:			
Crude thousand tons	4,216	4,533	Indonesia 1,217; Saudi Arabia 842.
Refinery products:			
Gasoline do	38	63	Iran 28; Bahrain 10.
Kerosine do	---	20	Iran 7; Bahrain 7; Japan 4.
Distillate fuel oil do	11	127	Saudi Arabia 19; Iran 16; Malaysia 16.
Lubricants do	89	83	United States 61.
Other do	19	19	United States 9; Indonesia 7.
Total do	157	312	

• Estimate.

Source: Department of Commerce and Industry, Bureau of the Census and Statistics. Foreign Trade Statistics of the Philippines 1964 and 1965, Manila, 1965 and 1966.

COMMODITY REVIEW

METALS

Chromite.—During 1967, output of refractory chromite declined steeply, and as the U.S. steel industry has traditionally depended upon the Philippines for more than half of its refractory needs, this drop in output could have an international impact. Output of metallurgical chromite, all exported to Japan, gained significantly but was only 2 percent of world output. Normally, the chromite industry has a yearly output value exceeding $10 million. At the Coto (or Masinloc) mine of Consolidated Mines, Inc., in Zambales the country's sole refractory chromite producer, output of standard lump ore dropped because of ore-grade problems and mining difficulties. Underground mining was started on some ore bodies, and a crushing plant and a flume were under construc-

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tion. The remodeled fines plant produced sizable tonnages of concentrates from stockpiled fines, however, the market for fines, has not been attractive when compared with that for lump ore. In view of the reserve situation, production of lump ore can probably return to the previous level. As of January 1, 1967, reserves totaled about 9.8 million tons, comprising 5 million tons of mine-run ore (including Parcel No. 1 of Zambales Mineral Reservation), 1.2 million tons of stockpiled high-silica fines, and 3.6 million tons of disseminated ore in place and in dumps.

Acoje Mining Co. Inc., a subsidiary of Marinduque Mining and Industrial Corp., dominated Philippine metallurgical chrome ore output. The only other producer, Palawan Consolidated Mining Co., had a small output. Acoje's new open pit in Zambales started operations in late 1966 and provided one-fifth of the 1967 mill-feed. Reserves for Acoje totaled 2.3 million tons at the beginning of 1967. Palawan Consolidated mined underground at Puerto Princesa, Palawan; reserves in 1967 were reported at 17,500 tons of 42- to 58-percent-grade chrome ore.

Copper.—About 10 mining companies produced copper in 1967; mine-copper output by major producers is shown in the following tabulation:

Company	1966	1967 e
Atlas Consolidated Mining and Development Corp.	27,550	30,200
Lepanto Consolidated Mining Co.	18,500	19,500
Marinduque Mining and Industrial Corp.:		
Bagacay mine	5,965	8,550
Sipalay mine	12,320	12,970
Philex Mining Corp.	6,750	6,180
Benguet Consolidated Inc.	NA	3,000
Samar Mining Co. Inc.	1,290	1,700
Other	1,383	1,663
Total	r 73,758	83,763

e Estimate. r Revised. NA Not available.

In recent years, most mines have been expanded and new reserves delineated. In addition, many new properties have been prospected and developed. At yearend 1967, the country had a half billion tons of reserves of disseminated copper ore grading 0.6 to 0.9 percent copper. Planned expansions and new facilities under construction indicate that Philippine copper mine output should continue to rise.

Atlas Consolidated with open pit and underground mines in Toledo, Cebu, plans to expand capacity 40 percent to eventually bring copper mine output to about 45,000 tons per year. At the beginning of 1967, its measured reserves were reported at 142 million tons of copper ore averaging 0.76 percent copper, and 42 million tons analyzing 0.66 percent copper. The firm ships its copper ore to Mitsubishi Metal Mining Co. Ltd., of Japan.

Marinduque Mining & Industrial Corp., which sells copper primarily to Mitsui Mining and Smelting Co., Ltd., of Japan, had a good year at both copper properties. To support the Sipalay open pit mine, recent capital construction included diversion of the Toangan River and transfer of a conveyor from the defunct Binulig pit to the Sansibit pit. A ball mill to raise daily milling capacity to 6,500 tons of ore was being installed in 1967, and plans were underway to further boost overall milling capacity to 8,000 tons by mid-1968. Sipalay's reserves, as of early 1967, were reported at 72 million dry tons analyzing 0.8 percent copper. The Bagacay open pit was recently retooled with bigger mining equipment. As a result, copper mine output in 1967 was roughly two-fifths more than in 1966. Bagacay's 2.8-percent-copper mine-run ore was upgraded to nearly 44,000 tons of concentrates in 1966; an additional 19,200 tons of straight shipping ore (7.5-percent-copper) was produced. Mitsui Mining and Smelting developed a process to recover copper and precious metals from tailings. Japanese companies have always recovered zinc from Philippine tailings.

Lepanto Consolidated Mining Co.'s. Mankayan mine in Mountain Province had a 1966 recorded output of 18,500 tons of copper, 62,110 ounces of gold, and 327,149 ounces of silver. Lepanto traditionally shipped ores to the Takoma Smelter of American Smelting and Refining Company. Operating costs were greatly reduced and profits increased in 1966 by raising daily milling capacity to 1,800 tons of ore. A plan to bring daily capacity up to 2,700 tons was underway at yearend 1967. Reserves were entirely reevaluated, and, in early 1967, stood at 7.82 million tons assaying 2.98 percent copper and 0.125 ounce gold, roughly two-thirds measured ore.

Philex Mining Corp.'s property at Tuba in Mountain Province was the country's only important underground

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porphyry copper mine. It underwent significant transitions in mining methods and extraction horizons, and a magnetite recovery circuit was added. Total estimated reserves were about 50 million tons of 0.74-percent-copper ore. An expansion program was being planned to increase production 50 percent by late 1968 so as to bring annual mine copper output to around 10,000 tons. This would necessitate the transfer of location as well as expansion of the present mill. Philex continued to sell to Nippon Mining Co. Ltd. of Japan.

Benguet Consolidated, Inc. open pit copper project in Balabac, Palawan, got into full production during 1967, after installation of facilities to accommodate 10,000 tons of ore monthly. Ores shipped at yearend 1967 analyzed about 6.7 percent copper and 46.8 percent sulfur. The Kennon Copper Mine of Black Mountain Inc., under development near Baguio and the Benguet Exploration Inc. gold-zinc property, initially planned a daily mill capacity of 1,500 tons of ore. About 12 million tons of 0.63-percent, disseminated copper ore have been delineated to be mined by block caving. Production may commence by yearend 1968, and concentrates will be trucked to Poro, La Union, for shipment to Nippon Mining in Japan. Consolidated Mines was developing a property in Magpog, Marinduque, and planned a 500-ton-per-day mill to treat the 2 to 3 percent copper ore. Copper Belt Mining Corp. at Lobo, Batangas, was still producing only small tonnages. As of January 1, 1967, reserves were reported at 177,000 tons of 2.1-percent-copper ore, and 12,000 tons of barite. Acoje Mining produced 15,700 tons of direct-shipping copper ore in 1966 from a property in the Sierra Madres that also produces manganese ore.

Gold and Silver.—Precious metal production increased slightly in 1967. Gold was priced at $50.38 per ounce, with mining companies receiving $35 directly from the Central Bank and $15.38 as subsidy. In addition to subsidies, the Government allotted about $385,000 for construction of feeder roads to assist the gold industry in 1967. Leading gold producers in 1966 and their output in ounces follows: Benguet Consolidated, Inc., 237,408; Lepanto Consolidated Mining Co., 62,110; Itogan-Suyoc Mines, Inc., 47,343; Philex Mining Corp., 28,745; Benguet Exploration Inc., 18,712; Paracale-Gumaus Consolidated, Mining Co. 13,108; and Baguio Gold Mining Company, 8,916.

At Benguet Consolidated, Inc. gold property in the Baguio area, tertiary crushers were installed and diversion tunnels were constructed to provide impounding facilities for mill tailings. Baguio Gold Mining shut down its Baguio mine in late 1966.

Gold remained a significant byproduct of copper for Philex Mining. Itogon-Suyoc Mines, Inc., has several properties. At its Itogon mine in Sangilo, Itogon, modifications in mill circuit were made to raise gold output. At the company's Suyoc mine in Mankayan, Mountain Province, efforts were being made to raise byproduct copper output. Daily ore output of Benguet Exploration's complex metal mine at Tuba, near Baguio, was being expanded from 40 to 60 tons per day. During 1966, in addition to precious metals, the firm produced 1,648 tons of mine zinc, as well as pyrite, cadmium, and copper. Paracale-Gumaus Consolidated Mining Co. signed a 2-year agreement with San Mauricio Mining Co. to mine the latter's Santa Ana group of claims beginning in 1967.

Iron Ore.—The Philippine iron-mining industry encountered increased pressure from Australian producers in competing for Japanese markets. Philippine Iron Mines Inc., the leading producer, recorded an output of only 807,334 tons of iron ore or equivalent product in 1966 at its Larap underground property. Minable reserves were reported at 27 million tons containing 27.3 percent "magnetic" iron content. Declining reserves of ores of direct-shipping grade meant that the concentrator which recovers only the magnetic components must process more feed to maintain sales. The completed pelletizing plant experienced technical difficulties in 1967.

The Sibuguey open pit project of Samar Mining Co. Inc., in Mindanao was the second-ranked producer, with an output of 378,975 tons of concentrates in 1966. As of January 1967, reserves totaled only 3.7 million tons containing 50 percent iron. In practice, 40 percent mine-run iron ores were upgraded to 59 percent for sale to Japan. Filmag Inc. and Maraveni Consolidated Co. provided small tonnages of beach-sand concentrates for lining Japanese blast furnaces. Philex Mining Corp. produced 48,762 tons of magnetite concentrates in 1966, and Atlas Consolidated

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Mining & Development Corp. sold some pyrite cinder to the Japanese.

Iron and Steel.—The small domestic steel industry is based upon scrap and imported semimanufactures. Negotiations between Japanese firms (Mitsui and Co., Ltd., and Yawata Iron and Steel Co., Ltd.) and Elizalde Iron and Steel Corporation of the Philippines resulted in an agreement in January 1968 for the Japanese to invest $1.6 million to help Elizalde build a 150,000-ton cold-rolled sheet and coil mill.

An electric smelting, Linz-Donawitz (LD) converter plant of roughly 300,000 tons annual capacity has reportedly been under construction in Iligan, Mindanao. The Santa Inez Steel Corp. was planning to build a 250,000-ton LD converter integrated steel plant in Rizal Province, based upon a 30-million-ton iron deposit.

Lead and Zinc.—Lead production in the Philippines has been nominal. Zinc shows promise, but low prices have held back extraction, and in fact, output has declined in recent years. Benguet Exploration Inc.'s gold mine near Baguio has been the country's only recorded zinc producer, and it is partly because of the gold content that zinc is recovered; three-fifths of the gold in the zinc concentrate shipped to Japan has been returned to the Philippines. Some zinc also went to Japan in the form of zinc-in-copper concentrates from Marinduque Mining's Bagacay mine.

Manganese.—Philippine manganese ore production attained moderate levels during 1965–67, when there was increased demand by the Japanese steel industry. Zambales Base Metals Inc., the foremost past producer, resumed operations at its Wright, Samar, property. Acoje Mining's Sierra Madre property in Isabella had developed reserves of about 40,000 tons of manganese ore and 20,000 tons of direct-shipping-grade copper ore at the beginning of 1967. The Vazlao Mining Company started mining manganese ore at Mandaon, Masbate, in late 1966.

Mercury.—High world demand and fluctuating prices had little effect on the Philippines' mercury output.

Palawan Quicksilver Mines, Inc., with a primarily open pit operation at Puerto Princessa in Palawan, was the country's only producer. Important exploration and development work in the last few years included 22 diamond drill holes, in 1966, that confirmed projected extensions of the main ore body. At the beginning of 1967, ore reserves were placed at 822,000 dry tons assaying 0.13 percent mercury—roughly a third more than a year ago. In addition, there were about 726,000 dry tons of ore containing less than 0.1 percent mercury. During 1966, three rotary kilns treated 70,393 tons of ores and concentrates averaging 0.141 percent mercury. Completion of installation of a fourth kiln was expected by the end of August 1967, and a new condensing system was installed on the third as well as on the new fourth kiln. With the additions, yearly output capacity can be raised to 3,300 flasks.

Nickel.—Exploitation of Philippine nickeliferous laterites came nearer realization when the large reserve in Parcel 2 of the Surigao Mineral Reservation was opened to bidding in April 1966. Roughly 100 million tons of delineated nickeliferous ores are involved, and large additional reserves can be developed. There were nine bidders, and a group composed of Marinduque Mining & Industrial Corp. and Sherritt Gordon Mines Ltd. was reported awarded a contract in April 1968 to mine nickel ore on Nonoc Island in Parcel 2. Sherritt Gordon plans to build a demonstration plant in Canada to prove out its recovery process. The Surigao Mineral Reservation Board which awarded the contract received technical assistance from the U.S. Bureau of Mines in evaluating proposals.

NONMETALS

Cement.—A boom in housing and an anticipated expansion program in highway building lifted Philippine cement production by 30 percent, to about 2.1 million tons in 1967, and annual plant capacity by one-third, to 3 million tons at yearend 1967. In early 1968, 10 cement plants were in full operation and five plants were under construction. The expansion may result in a slight surplus for export. In anticipation of competition from other producers, the Cement Association of the Philippines negotiated with counterparts in various Far East countries (excluding Japan) during 1967 for a common, overseas marketing agreement.

In 1966, facilities of Filipinas Cement Co. and Universal Cement Co. Inc., were greatly expanded, making the former the largest producer in 1967. Mindanao Port-

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land Cement Corp. completed a new plant in 1966, and the U.S. firm, Lone Star Cement Co., was given permission to build a plant. Two more cement plants, one owned by Marinduque Cement Co. and the other by Pacific Cement Corp., came on stream during 1967. Another significant development was the sharp increase in the rated capacity of Republic Cement Corp. Island Cement Co. will have the biggest single rotary kiln in Southeast Asia with a daily capacity of 1,300 tons.

By 1968, the five plants under construction should be in production. These are the Hi Cement, Bacnotan No. 2, Tayabas, Luzon, and Continental plants. With Mindanao Portland Cement Corp.'s. further expansion of facilities, total rated capacity by yearend 1968 should exceed 4 million tons.

Feldspar.—The Philippine glass industry obtained all feldspar from domestic sources. Nin Bay Mining Co., the foremost producer, reported an output of 12,237 tons for the period May to October 1967.

Fertilizer and Pyrite.—The rising demand for fertilizers was met by greater domestic production supplemented by imports.

Marinduque Mining's Bagacay mine provided three-fifths of the Philippine pyrite output in 1967. This pyrite was sold mainly to ESSO Standard Fertilizer & Chemical Co., Inc.'s, plant at Bataan. Atlas Consolidated, which has extensive pyrite reserves, was the only other important producer; its pyrite has been shipped mainly to Atlas Fertilizer Corp. in Cebu, which is 40 percent owned by Atlas Consolidated.

ESSO Standard Fertilizer & Agricultural Chemical Co., Inc. produced granular fertilizers, urea prills, aqua ammonia, phosphoric acid, and sulfuric acid in a plant adjacent to the ESSO Standard Philippines oil refinery. Maria Christina Fertilizer Corporation in Mindanao installed new equipment to produce ammonia by the steam naphtha process, raising capacity from 40 to 100 tons per day.

Sulfur.—Sulfur production has been nominal but will probably increase. Benguet Consolidated, Inc., has been developing a large sulfur deposit in Negros Oriental. As of the beginning of 1967, the company's proven and probable reserves of sulfur ore were estimated at 10 million tons analyzing 27 percent sulfur. Its plan was to produce 2,000 tons of ore per day, or about 165,000 tons of elemental sulfur annually.

MINERAL FUELS

Coal and Coke.—Philippine coal production continued to decline, but requirements for both coal and coke were nominal, the latter being met by small imports.

Among the occurrences of high-rank coals, only Malangas shows some promise. The Philippine Bureau of Mines recently made some washability studies on the characteristics of Malangas Lumbog high-volatile C bituminous coal in the hope that it would be suitable for blending with Australian coals.

Petroleum.—The approximately $50 million spent in the Philippines in the search for oil since World War II has produced no results, and exploration activities were virtually halted about 3 years ago. However, many claim that additional capital and more incentives may yet lead to significant discoveries. It was suggested that the Government should match private investments in oil exploration. During 1966 the duration of oil exploration concessions was increased from 10 to 25 years. Approved House Bill No. 1396 permits holders of drilling leases to convey them to exploration concessions under Act No. 387 as amended.

Activities in oil imports and refining have been much more significant to the economy. During 1966, the country imported about $88 million worth of mineral fuels, mostly crude oil, which was quite a drain on foreign exchange. If only because of increased prices, the corresponding value of the 1967 imports would be higher. Moreover, consumption probably increased, judging from a roughly 5 percent rise in refinery output over 1966.

As of the beginning of 1968, the total Philippine annual petroleum-refining capacity was reported at 144,000 barrels per day. Four refineries were in operation: ESSO Standard Philippines, Caltex (Philippines), Inc., Shell Company of the Philippines Ltd., and Filoil Refinery Corp. The crude imported in 1967 to support the refineries probably exceeded 6 million tons.

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The Mineral Industry of Poland

By Bernadette Michalski [1]

Poland's mineral resources continued to sustain a significant production of bituminous coal, sulfur, zinc, cement, and copper in 1967. The country also produced sizable quantities of iron and steel, petroleum products, and aluminum; but virtually all the raw material requirements except coal for these industries were imported, with the major supply derived from the U.S.S.R. and Hungary. The mineral industry, whether based on indigenous or imported raw materials, was of growing importance to the Polish economy and in 1967 contributed more than 25 percent of the total industrial product and accounted for approximately 20 percent of industrial employment.

The overall industrial growth rate for 1967 was reported at 7.5 percent. However, segments of the mineral industry achieved growth rates nearer 10 percent in 1967 with the sulfur and natural gas-based chemical industry achieving a 13.9-percent growth rate.

PRODUCTION

With the exception of aluminum and natural gas production, mineral and metallurgical output attained and in most cases surpassed planned goals for 1967. The achievements by the industry are largely the result of a continued emphasis on exploration, mechanization, and modernization. The following table shows recent development and mechanization activities for selected branches of the mineral industry:

[1] Commodity research specialist, Division of International Activities.

	1960	1965
Iron and steel:		
Number of blast furnaces	26	27
Number of open hearth furnaces	93	95
Steel output per square meter of hearth per 24 hours, metric tons	5.7	6.9
Lead-zinc mining:		
Number of mines	6	7
Employment	10,400	9,900
Ore production, thousand metric tons	2,360	3,569
Coal mining:		
Number of underground mines	80	82
Number of surface mines	46	23
Share of total output extracted mechanically, percent	34	50
Share of total loading conducted mechanically, do.	28	55
Crude petroleum and natural gas production:		
Number of wells	3,182	3,121
Crude oil output, thousand metric tons	194	400
Natural gas output, thousand cubic feet	20,205	55,373
Crude oil and natural gas output per industrial worker per year [1], metric tons petroleum equivalent	135.4	397.6
Petroleum refining:		
Number of refineries	5	6
Crude oil processed per industrial worker, metric tons	362.1	976.6

[1] Natural gas converted to petroleum equivalent at the rate of 1,000 cubic meters of gas = 1 metric ton of petroleum equivalent.

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Table 1.—Poland: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Aluminum ingot—thousand tons	47	48	47	55	92
Cadmium e	420	r 425	r 440	430	NA
Copper:					
Ore:					
Gross weight—thousand tons	2,162	2,247	2,356	2,507	e 2,750
Metal content e	13,200	14,500	15,100	16,100	e 17,300
Electrolytic	29,633	36,645	37,400	39,847	42,200
Iron and steel:					
Iron ore—thousand tons	2,609	2,680	2,862	3,054	e 3,125
Pig iron and ferroalloys—do	5,395	5,643	5,760	5,856	6,581
Steel ingots and castings—do	8,004	8,573	9,088	9,850	10,451
Semimanufactures:					
Pipe—do	474	r 494	r 508	544	e 600
Other rolled—do	r 5,457	r 5,709	r 6,130	6,578	6,994
Total—do	r 5,931	r 6,203	r 6,638	r 7,122	e 7,594
Lead:					
Ore:					
Gross weight—do	2,556	2,597	r 3,307	3,569	NA
Metal (lead) content	38,700	38,300	41,200	45,100	NA
Refined	38,914	41,501	41,386	e 43,487	44,300
Nickel	1,105	1,205	1,101	e 1,300	e 1,300
Silver e—thousand troy ounces	129	129	129	129	129
Zinc:					
Zinc content of lead-zinc ore	147,100	150,700	r 152,100	r 150,300	196,100
Refined:					
Electrolytic	83,500	87,300	90,000	92,000	NA
Other	97,700	99,600	100,400	101,000	NA
Total	181,200	186,900	190,400	193,000	NA
Nonmetals:					
Barite	45,700	e 45,700	e 45,700	e 47,000	e 47,000
Cement—thousand tons	7,674	8,761	9,573	10,041	11,138
Fertilizer materials:					
Nitrogenous, manufactured bulk—do	1,330	1,451	r 1,523	1,706	NA
Phosphatic:					
Phosphate rock	64,800	89,000	93,000	e 93,000	NA
Manufactured bulk—thousand tons	1,389	1,644	r 1,792	1,889	NA
Feldspar	26,700	e 26,700	e 26,700	e 28,000	NA
Gypsum:					
Crude—thousand tons	585	e 760	e 762	r 760	NA
Calcined—do	117	156	158	r 156	NA
Lime:					
Crude, construction and industrial—do	2,433	2,680	2,877	3,014	e 3,200
Quicklime, hydrated lime, and dead-burned dolomite—do	2,004	2,173	2,260	e 2,401	NA
Magnesite	26,600	38,000	42,000	e 42,000	NA
Pyrite, gross weight—thousand tons	216	234	e 240	e 240	NA
Salt:					
Rock—do	645	660	674	r 762	NA
Other—do	1,487	1,581	1,623	r 1,647	NA
Total—do	2,132	2,241	2,297	2,409	e 2,500
Sulfur:					
Ore, gross weight—thousand tons	1,791	2,439	2,959	3,077	NA
Content of ore—do	235	295	431	477	NA
Mineral fuels:					
Coal:					
Bituminous—do	113,150	117,354	118,831	121,979	123,900
Brown—do	15,344	20,250	22,626	24,508	e 23,900
Briquets, all kinds—do	996	999	949	r 936	NA
Coke, all kinds—do	14,609	14,931	15,196	e 15,075	15,200
Gas, natural—million cubic feet	35,275	45,980	51,419	51,356	55,373
Peat, fuel—thousand tons	102	100	78	r 60	NA
Petroleum:					
Crude—thousand tons	213	282	339	400	450
Refinery products:					
Gasoline—do	305	385	r 707	819	e 975
Kerosine—do	21	16	31	20	NA
Unspecified—do	1,116	1,532	2,678	2,866	NA
Total—do	1,442	1,933	r 3,416	3,705	4,098

p Preliminary. e Estimate. r Revised. NA Not available.

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TRADE

Trade in minerals and metals represented more than a quarter of Poland's total trade turnover in 1966 with mineral imports totaling 2,495 million zloty[2] and mineral exports totaling 2,258 million zloty as shown in the following tabulation:

	Value (million zloty)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	2,341	8,911	26.3
1966	2,258	9,088	24.8
Imports:			
1965	2,351	9,361	25.1
1966	2,495	9,976	25.0
Trade balance:			
1965	−10	−450	XX
1966	−237	−888	XX

XX Not applicable.

Imports of iron and steel in crude or finished form totaled 725 million zloty surpassing liquid fuels at 645 million zloty. Coal and coke exports accounted for more than half of the mineral exports at 1,330 million zloty.

The Soviet Union continued as Poland's principal trade partner in 1966 perpetuating Poland's hard currency defficiency. Foreign exchange difficulties have been a contributing factor in many delays and postponements of planned industrial investments and thus have resulted in a growing interest in increased industrial exports to the hard currency market of the West.

[2] Throughout this chapter, the official currency unit of Poland, the zloty (Zl), has been used rather than the U.S. dollar because actual exchange rates differ considerably from the official Zl 1=US$0.25. In most cases, the zloty is overvalued.

Table 2.—Poland: Export of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Cadmium	339	399	U.S.S.R. 160; West Germany 103.
Iron and steel:			
Iron ore	21,723	19,032	United Kingdom 17,625.
Pig iron and cast iron	10,686	17,840	Switzerland 7,000; Sweden 3,945; Albania 3,000.
Ferroalloys	r 4,404	3,073	United Kingdom 781; West Germany 727; Austria 641.
Semimanufactures	952,677	937,992	Czechoslovakia 117,495; United States 88,838; Rumania 77,053.
Lead concentrate	12,365	16,282	West Germany 13,337; Netherlands 2,945.
Zinc:			
Metal and dust	81,261	72,782	United Kingdom 19,150; Sweden 7,950; Hungary 7,066.
Alloys	7,995	8,906	U.S.S.R. 5,595; Brazil 2,111.
Rolled products	15,791	12,625	U.S.S.R. 4,013; Czechoslovakia 2,577; Denmark 2,000.
Nonmetals:			
Cement—thousand tons	685	644	Spain 204; Ghana 101; Peru 96; United Arab Republic 50.
Cement clinker—do	149	71	Spain 26; Nigeria 25; Sierra Leone 20.
Clays, refractory	78,821	60,534	Italy 20,698; Hungary 19,669; Yugoslavia 10,591.
Lime burned	60,212	58,166	Czechoslovakia 35,737; Netherlands 19,682.
Pyrite	8,771	39,551	Czechoslovakia 20,042; United Kingdom 11,504.
Salt, rock	122,004	119,688	Sweden 47,626; Hungary 31,154; Finland 11,783.
Sulfur, elemental	241,008	271,727	Czechoslovakia 119,865; Italy 40,858; Sweden 34,555; United Kingdom 30,977.
Mineral fuels:			
Coal:			
Bituminous—thousand tons	21,045	22,407	U.S.S.R. 7,198; Denmark 2,760; East Germany 1,993; Czechoslovakia 1,974; Finland 1,484; Austria 1,419.
Brown, including briquets—do	5,199	5,060	All to East Germany.
Coke—do	2,324	2,358	East Germany 853; U.S.S.R. 656; Hungary 288; Rumania 121.
Petroleum: Refinery products—thousand tons	1,027	519	West Germany 198; Austria 160; U.S.S.R. 74.

r Revised.

Source: Glowny Urzad Statystyczny Rocznik Statystyczny Handlu Zagranicznego 1966 (Annual Statistics of Foreign Trade 1966). Warsaw, Poland, 1967, 468 pp.

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Table 3.—Poland: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources in 1966
Metals:			
Aluminum:			
Alumina	86,069	120,032	Hungary 86,743; United Kingdom 15,747.
Bauxite	115,802	115,511	All from Hungary.
Bismuth	67	60	All from United Kingdom.
Cadmium	8	2	All from Bulgaria.
Chromite	155,253	144,206	U.S.S.R. 67,129; Albania 33,314; Cuba 22,702.
Copper:			
Concentrate	16,437	20,882	United Kingdom 9.595; Morocco 4,224; Cuba 3,518.
Metal including wire	29,009	36,463	United Kingdom 21,821; U.S.S.R. 6,124; West Germany 2,293.
Iron and steel:			
Iron ore thousand tons	9,273	9,429	U.S.S.R. 7,825; Sweden 688; Brazil 191.
Pig iron do	793	775	U.S.S.R. 741; Czechoslovakia 26.
Ferroalloys	1,848	3,917	U.S.S.R. 3,059; Austria 376.
Steel ingots and semimanufactures.	497,743	746,421	U.S.S.R. 345,150; Czechoslovakia 145,256.
Lead:			
Metal	19,647	17,397	U.S.S.R. 3,999; Yugoslavia 3,650; United Kingdom 3,252.
Magnesium	300	400	All from U.S.S.R.
Manganese:			
Ore	347,908	397,572	U.S.S.R. 317,526; India 29,769; Cuba 26,195.
Peroxide	3,566	3,859	U.S.S.R. 2,114; Morocco 1,083.
Mercury 76-pound flasks	r 9,106	8,180	United Kingdom 4,351; Netherlands 1,392.
Molybdenum concentrate	107	248	Mainland China 160.
Tin long tons	2,517	3,421	United Kingdom 2,417.
Tungsten concentrate	2,328	2,955	United Kingdon 2,223; mainland China 650.
Zinc:			
Concentrate	146,132	100,891	Canada 31,881; Finland 11,557; West Germany 11,027.
Metal and dust	4,573	966	Bulgaria 829; North Korea 137.
Nonmetals:			
Asbestos	32,512	42,360	U.S.S.R. 17,979; Canada 13,305; Italy 4,594.
Barite	7,023	9,885	Mainland China 6,999; Belgium 1,595.
Bentonite	3,707	3,846	Yugoslavia 2,630; Hungary 1,175.
Cement	321,251	300,325	U.S.S.R. 190,058; Rumania 60,307; Hungary 49,441.
Clays, refractory	22,284	16,826	U.S.S.R. 9,930; Czechoslovakia 4,516; East Germany 1,059.
Cryolite	1,460	4,127	U.S.S.R. 1,866; Italy 1,401.
Diatomaceous earth	602	937	Belgium 606; Austria 331.
Fertilizer materials:			
Nitrogenous	285,000	87,000	Hungary 44,000; Czechoslovakia 43,000.
Phosphatic:			
Apatite thousand tons concentrate.	557	630	All from U.S.S.R.
Other do	655	607	Morocco 358; Tunisia 149.
Potassic do	1,273	1,543	East Germany 991; West Germany 258.
Fluorspar	30,262	40,214	Mainland China 18,509; East Germany 17,433.
Graphite	10,572	12,463	Czechoslovakia 8,549; U.S.S.R. 1,727; mainland China 1,112.
Kaolin	71,181	77,796	Czechoslovakia 49.652; East Germany 15,238.
Magnesite	159,616	154,691	North Korea 87,041; Czechoslovakia 41,547; Yugoslavia 22,207.
Mica	1,102	1,035	United Kingdom 531; India 292; Rumania 209.
Talc, powder	17,801	14,733	North Korea 10,621; mainland China 1,499; Austria 860.
Mineral fuels:			
Coal:			
Anthracite thousand tons	35	23	All from U.S.S.R.
Bituminous do	1,210	1,141	U.S.S.R. 842; East Germany 299.
Brown coal including briquets. thousand tons	637	480	All from East Germany.
Coke do	-------	71	All from Czechoslovakia.
Gas, natural million cubic feet	13,281	24,783	All from U.S.S.R.
Petroleum:			
Crude thousand tons	3,215	3,347	All from U.S.S.R.
Refinery products:[1] do	2,248	2,342	U.S.S.R. 1,609; Rumania 289.

r Revised.
[1] No breakdown reported.
Source: Glowny Urzad Statystyczny Rocnik Statystyczny Handlu Zagranicznego 1966 (Annual Statistics of Foreign Trade 1966). Warsaw, Poland, 1967, 468 pp.

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COMMODITY REVIEW

METALS

Aluminum.—The 47,500-ton initial capacity Konin aluminum reduction plant, built under Péchiney (French) license, opened in July 1966 but did not reach full production until late 1967 which accounted for the aluminum industry's failure to meet planned output in 1967. In the first 10 month's of operation, 21,000 tons of aluminum was produced at Konin, most of which has been exported to Hungary in payment for imported alumina. In mid 1967 a sheet-rolling mill was under construction at Konin. Planned completion date for the mill is 1970.

Research and pilot plant operations for the recovery of alumina from clays continued; however the cost of production of alumina from this source was reported to be still 40 percent above the cost of imported materials.

Copper.—Development of the Lubin and Polkowice mines continued with production scheduled for 1968 at 25 percent of the proposed combined capacity of 9 million tons to be attained by 1972. Copper processing facilities were under expansion to accommodate mine output. Annual capacity of the Legnica plant (H. Walecki Works) was doubled, reaching 60,000 tons at the close of 1967. An electrolytic copper plant of 40,000-ton-per-year capacity was planned for the Zukowice area. Construction was slated to begin in 1968.

Iron and Steel.—The Lenin Steel Works at Nowa Huta was under expansion to increase its annual capacity from 3.2 million tons to 5.5 million tons by 1977. As part of the expansion program, an oxygen converter plant with an annual capacity of 1 million tons was put in operation during the year. Construction continued on a 5-million-ton rolling mill scheduled for production during 1968.

Zinc.—The discovery of a 12-million-ton contained zinc reserve in the Olkusz region in 1966 fostered increased activity and investment in the area. Construction continued on the Olkusz mine and an extension of the Orzel Bialy mine was undertaken during the year. A new zinc mill was opened in Miasteczko Slaskie with one of four 95-meter-long tilting furnaces in operation and a shaft furnace was reported to be in trial operation at yearend. The Miasteczko Slaskie plant is expected to double Poland's output of zinc concentrates.

NONMETALS

Cement.—The Nowina cement plant near Kielce started full production during the year. The plant has five rotary kilns and four fully automated lime furnaces. Production in 1967 was estimated at 800,000 tons of 350-grade Portland cement.

Sulfur.—Development work continued on the Machow mine at the Tarnobrzeg deposit, and a second mine was under development at Grzybow. Investments and development activity proceeded on schedule. If the proposed annual output of 1.6 million tons of sulfur in 1975 is realized, Poland will become one of Europe's largest sulfur exporters.

MINERAL FUELS

Coal.—Increased coal production is generally attributable to extensive mechanization and expansion activities. During the year expansion of the Szczyglowice mine continued. By 1970 the mine expected to increase its present daily output from 5,500 tons to 9,000 tons. Other mines currently undergoing expansion are the Jastrzebie, Mortimer-Porabka, 1 Maja, and Staszic.

Petroleum and Natural Gas.—Petroleum exploration efforts continued throughout the year with a reported 345,000 meters of exploratory wells drilled. Refining capacity for processing imported U.S.S.R. crude petroleum was under expansion during the year. A second distillation column was under construction at the Plock refinery and scheduled for completion in 1968. An increase of 3 million tons in annual capacity should be realized when the column and auxiliary equipment are operational.

Investments in natural gas production and transportation have been lagging about a year behind schedule; however the natural gas pipeline connecting Pulowy, Warsaw, Tarnow, and Skawina was near completion at the close of 1967.

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The Mineral Industry of Portugal

By Justin B. Gowen [1]

Portugal's total output of ores and industrial minerals (excluding raw materials for construction) in 1967 declined slightly on a tonnage basis, but output value increased 8.3 percent from $18.1 million to $19.6 million. This value gain was almost wholly due to higher tungsten concentrate production, although gold ore output also increased. Substantial quantitative gains were shown in output of construction materials, including cement, lime, clay and their products, but the value of raw materials used in their production was not reported. Similarly, outputs were higher for steel and refined petroleum, but this production was based primarily upon imported materials.

Late in 1967 the targets were announced for Portugal's Third Development Plan, covering 1968–73. The Plan foresees an average annual growth rate of 9 percent for the total of manufacturing industries, including the following mineral based sectors: Chemicals and petroleum, 9.5 percent; nonmetals, 8 percent; and base metals, 12 percent. The plan calls for a total investment of $4.3 billion in Metropolitan Portugal and $1.5 billion in the Overseas Provinces. Individual mineral commodities expected to benefit mainly from new investment include those which provide the principal export earnings; namely, lead, zinc, tungsten, pyrites, manganese, marble, feldspar, and quartz.

PRODUCTION

Although complete detailed statistics on Portuguese mine and mineral processing plant output during 1967 were not available at the time of this writing, increases in production of steel, manganese ore, tungsten concentrate, cement, phosphate fertilizers, anthracite coal, and refined petroleum were certain; and there were indications of expanded production of some crude construction materials, although these had not been reported officially. Nonferrous base metal production slumped, as did nitrogenous fertilizer output.

[1] Foreign minerals specialist, Division of International Activities.

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Table 1.—Portugal: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Aluminum and alloy castings	354	r 584	r 469	676	381
Antimony content of concentrate	6	12	11	4	23
Arsenic, white	564	372	r 186	r 194	NA
Beryl, 10 percent BeO	2	18	40	r 12	37
Columbite-tantalite concentrate (70 percent Ta_2O_5 and Cb_2O_5)	10	3	5	r 10	11
Copper:					
In cupriferous pyrites	3,025	4,119	r 3,684	3,468	NA
In other ore and concentrate	180	167	114	186	106
In copper precipitates	85	79	64	81	54
Total mine production	3,290	4,365	r 3,862	r 3,735	NA
Copper sulfate	11,326	9,381	10,024	r 7,124	7,800
Refined	4,584	r 3,392	r 3,778	r 3,939	3,857
Gold:					
In ores—thousand troy ounces	22	21	22	r 19	27
Refined—do	1	8	20	23	NA
Iron and steel:					
Iron ore:					
Hematite and magnetite—thousand tons	224	172	165	r 139	142
Manganiferous—do	39	43	46	r 53	54
Pig iron and cast iron—do	235	263	269	241	285
Ferroalloys:					
Ferromanganese	717	672	683	838	NA
Ferrosilicon	4,944	4,707	6,058	7,147	NA
Ferrotungsten	------	327	218	r 245	370
Ingots and other primary forms:					
Linz-Donawitz—thousand tons	r 182	207	232	214	266
Electric—do	r 40	43	41	r 57	50
Total—do	222	250	273	r 271	316
Semimanufactures:					
Heavy sections—do	9	7	22	14	NA
Light sections—do	107	120	139	166	NA
Wire rod—do	47	43	44	37	NA
Other—do	9	33	24	30	NA
Total—do	172	203	229	r 247	224
Iron and steel castings and forgings—do	40	43	51	52	68
Lead:					
Content of ore and concentrate	224	196	152	r 1,715	1,848
Refined, primary	1,118	1,366	1,308	r 1,058	1,070
Alloy ingots	551	676	583	43	NA
Semimanufactures	1,722	2,764	2,862	2,864	NA
Manganese ore, 38 to 42 percent Mn	8,558	6,995	7,765	8,607	9,662
Silver:					
In ores—thousand troy ounces	48	49	63	r 355	357
Refined—do	116	178	721	1,040	NA
Tin:					
Concentrate:					
Gross weight—long tons	r 1,027	966	r 796	r 858	882
Metal content—do	718	676	r 557	r 600	617
Metal—do	663	589	603	r 556	619
Titanium ore (ilmenite) 50 percent TiO_2	41	57	75	r 481	409
Tungsten concentrate:					
Gross weight	1,330	1,451	1,350	r 1,627	1,887
Tungsten trioxide content	971	1,060	986	r 1,199	1,396
Uranium oxide (U_3O_8)e	10	r 18	r 38	r 42	NA
Zinc: Content of ore and concentrate	172	952	2,954	r 2,345	507

See footnotes at end of table.

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Table 1.—Portugal: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Nonmetals:					
Asbestos	26	--------	49	9	33
Barite	1,658	348	3,308	r 1,016	217
Cement, hydraulic:					
Cement thousand tons	1,433	1,622	r 1,680	r 1,720	1,836
Clinker do	115	212	99	161	NA
Clays do	222	257	362	94	NA
Diatomite	1,875	2,002	2,627	r 3,488	3,908
Dolomite	3,920	5,370	2,975	4,538	NA
Feldspar	402	11,170	8,296	r 1,629	NA
Fertilizer materials, manufactured:					
Nitrogenous:					
Ammonium sulfate thousand tons	249	245	278	r 252	209
Calcium cyanamid do	10	9	8	10	10
Calcium nitrate do	16	21	23	15	8
Ammonium nitrate do	169	193	194	r 200	206
Ammonium sulfate nitrate do	6	5	3	5	10
Urea and other elementary fertilizers thousand tons	1	18	29	r 40	40
Total do	451	491	535	r 522	483
Phosphatic and superphosphates thousand tons	442	431	430	r 408	495
Mixed and other do	108	140	147	161	NA
Total do	1,001	1,062	1,112	r 1,091	NA
Gypsum do	60	65	81	r 113	NA
Kaolin do	38	38	r 40	r 34	36
Lime, hydraulic do	158	166	160	182	202
Pyrites:					
Cupriferous do	298	412	323	r 330	NA
Other do	304	195	293	r 228	NA
Total do	602	607	r 616	558	528
Sulfur content do	277	279	r 283	257	243
Quartz do	10	24	8	23	NA
Quartzite do	24	8	r 191	191	NA
Salt:					
Evaporated thousand tons	268	232	r 409	r 339	NA
Rock salt do	79	89	90	r 98	113
Sand and gravel do	359	573	501	540	NA
Stone, not elsewhere specified:					
Marble do	41	56	49	144	NA
Granite do	447	211	r 734	998	NA
Slate do	76	79	85	73	NA
Limestone and marl do	1,917	1,988	2,252	2,779	NA
Porphyry and schist do	161	174	184	107	NA
Other stone do	49	40	r 30	40	NA
Sulfur, ground, precipitated or sublimed	9,119	6,130	9,737	6,328	NA
Talc	540	800	710	800	NA
Mineral fuels:					
Coal:					
Anthracite thousand tons	416	444	428	r 420	443
Lignite do	142	101	90	51	39
Briquets do	45	41	34	r 38	NA
Coke, gas do	25	10	13	15	NA
Manufactured gas thousand cubic feet	2,966	3,143	r 3,228	3,330	3,622
Petroleum refinery products:					
Gasoline thousand tons	380	379	391	399	407
Kerosine do	166	184	199	185	191
Jet fuel do	32	29	39	75	96
Gas oil do	290	322	331	371	368
Residual fuel oil do	510	570	596	567	619
Butane and propane do	56	46	45	39	34
Other petroleum gases do	20	23	27	34	57
Other petroleum products do	17	17	20	18	
Total do	1,471	1,570	1,648	1,688	1,772

• Estimate. p Preliminary. r Revised. NA Not available.

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TRADE

The gross value of all commodity exports, $685 million in 1967, was 10.5 percent greater than in 1966, while the gross value of all commodity imports declined by about 1 percent to $1,013 million. However, preliminary figures on various commodity groups indicate that mineral exports declined in value by more than 14 percent to about $77 million in 1967. The United States received about 10 percent of the gross exports and provided 7 percent of the gross imports in 1967. Comparable figures for mineral commodities alone were not available. The role of mineral commodities in total trade for 1965 and 1966 is indicated in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	80.7	576.4	14.0
1966	89.6	619.5	14.5
Imports:			
1965	210.9	923.5	22.8
1966	226.6	1,022.8	22.2
Trade balance:			
1965	−130.2	−347.1	XX
1966	−137.0	−403.3	XX

XX Not applicable.

Table 2.—Portugal: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum, all forms	134	321	West Germany 171; Italy 55.
Arsenic, white	354	381	Spain 350.
Beryl	55	10	All to the United States.
Copper:			
Ore and concentrate	19	47	Spain 34.
Matte	1,987	10	Belgium-Luxembourg 10.
Metal, all forms except scrap	1,102	1,727	Italy 878; Netherlands 251; United Kingdom 225.
Scrap	44	61	United Kingdom 41.
Gold bullion and semimanufactures. troy ounces	170	NA	
Iron and steel:			
Iron ore and concentrate, including roasted pyrites.	6,825	350	Sweden 340.
Scrap	30,877	11,748	Spain 11,215.
Pig iron and ferroalloys	4,438	6,931	West Germany 3,683; United Kingdom 1,696.
Steel ingots and other primary forms	13,799	6,636	France 4,521; Mozambique 2,005.
Semimanufactures	11,016	15,979	Angola 5,487; Mozambique 2,281; Spain 1,670.
Lead:			
Ore and concentrate	229	2,774	Italy 2,197; West Germany 577.
Oxides	67	84	Angola 30; Spain 20; Republic of South Africa 20.
Metal, all forms	124	162	Angola 60; United Kingdom 41.
Manganese ore and concentrate	2,885	7,828	Spain 7,678; Netherlands 150.
Nickel, all forms	4	19	United Kingdom 15; Angola 2.
Platinum group, metals and alloys. troy ounces	1,788	1,132	United Kingdom 611; West Germany 521.
Silver and alloys do	3,542	161	All to Angola.
Tantalum ore and concentrate	21	30	United States 28.
Tin:			
Ore and concentrate long tons	35	-------	
Metal, all forms do	238	111	Angola 53; Mozambique 24.
Tungsten ore and concentrate	1,357	1,341	United States 396; Netherlands 391; United Kingdom 244.
Zinc:			
Ore and concentrate	8,433	5,686	All to France.
Zinc oxides	58	79	Angola 35; Mozambique 31.
Metal, all forms	226	242	Italy 111; Norway 43; South Viet Nam 39.
Molybdenum, titanium, vanadium, zirconium ores.	51	980	All to Spain.
Ashes and residues, n.e.s. containing nonferrous metals.	743	965	Belgium-Luxembourg 670; Spain 221.
Nonferrous base metals, n.e.s.	3	157	NA.

See footnotes at end of table.

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Table 2.—Portugal: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals:			
Abrasives:			
Natural (diatomite, pumice, and other)	524	351	United Kingdom 200; Lebanon 49.
Manufactured (grindstones)	102	149	Angola 49; United States 39; South Viet-Nam 26.
Asbestos:			
Crude	42	18	All to the United States.
Asbestos cement and cement products	627	1,112	Cape Verde Islands 620; Guinea 418.
Barite and witherite, natural	20	995	Mozambique 799; France 170.
Cement	234,353	164,902	Spain 148,069.
Chalk	232	85	Angola 61; Mozambique 12.
Clays, clay products, and refractory products, n.e.s:			
Crude:			
Kaolin	10,587	2,435	Italy 1,350; France 600; Spain 402.
Other clays	2,941	1,257	Spain 1,028; Angola 188.
Construction materials:			
Brick and other nonrefractory	23,530	20,398	Spain 8,009; Angola 2,302; Mozambique 2,091.
Refractory	1,459	798	Angola 491.
Diamond, gem—thousand carats	1,148	1,385	All to the United Kingdom.
Feldspar	9,639	11,677	United Kingdom 5,588; France 1,900
Fertilizer materials:			
Crude, natural	199	297	All to West Germany.
Manufactured:			
Nitrogenous	r 86,658	85,584	Spain 25,073; Morocco 24,712; Angola 9,602.
Phosphatic [1]	44,224	65,025	Turkey 35,420; Pakistan 11,530.
Potassic	1,474	929	Angola 766.
Mixed	24,116	24,003	Cyprus 9,886; Turkey 5,800; Greece 2,950.
Gypsum and anhydrite	202	387	Angola 205; Mozambique 92.
Lime, hydraulic	1,786	2,303	Spain 1,020; Mozambique 749.
Mica	847	1,359	Italy 1,310.
Pigments, mineral	131	113	Angola 42; Mozambique 31.
Pyrites, unroasted	318,631	272,522	Belgium-Luxembourg 150,430; Netherlands 58,810.
Quartz and quartzite	12,972	19,923	Italy 10,800, West Germany 5,766.
Stone, sand and gravel:			
Dimension stone:			
Marble and other calcareous, crude or rough cut.	122,823	121,937	Italy 74,573; West Germany 20,554.
Slate, crude and worked	12,549	12,401	Belgium-Luxembourg; 3,503 West Germany 2,629; France 2,173.
Other, crude and worked	173,748	166,093	West Germany 79,831; Denmark 16,693; United States 10,010.
Gravel and crushed stone	2,719	1,964	Mozambique 1,205, Angola 213.
Sand, not metal bearing	16,666	32,579	Gibralter 31,871.
Sulfur, elemental, all forms	647	947	Mozambique 557; Cyprus 198; Angola 147.
Nonmetallic minerals, n.e.s	r 389	1,103	NA.
Mineral fuels:			
Asphalt and bitumen, natural	338	48	Guinea 21.
Coal, coke, and briquets	224	113	Cape Verde 75; Guinea 30.
Coal distillation products	25	98	Morocco 70.
Petroleum refinery products:			
Gasoline	43,574	48,651	United Kingdom 13,801; Guinea 11,572; Mozambique 9,648.
Kerosine	107,889	134,462	Netherlands 74,109; ships' bunkers 45,747; United Kingdom 10,756.
Distillate fuel oil	9,312	18,935	Guinea 7,268; United Kingdom 4,491; Cape Verde Islands 2,707.
Residual fuel oil	69,614	75,355	Ships' bunkers 43,874; Morocco 15,414; United Kingdom 15,214.
Lubricants	4,608	5,342	Angola 2,741; Mozambique 1,837.
Nonchemical coal and petroleum waste	952	88	NA.
Liquid petroleum gases	803	491	Guinea 213; Cape Verde Islands 89.

r Revised.
NA Not available.
[1] Mainly basic slag.

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Table 3.—Portugal: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys:			
Bauxite	3,532	4,379	France 3,363; British Guiana 508.
Alumina and aluminum hydroxide	366	533	West Germany 272.
Scrap	44	61	United Kingdom 34.
Metal, unwrought	1,176	849	United Kingdom 385; France 209; Canada 112.
Semimanufactures	7,311	8,144	Austria 1,520; West Germany 1,241; Belgium-Luxembourg 1,067; France 1,033.
Chromium:			
Chromite	108	119	United Kingdom 80; Netherlands 34.
Oxides and hydroxide	72	87	United Kingdom 42; West Germany 38.
Copper and alloys:			
Scrap	136	119	Mozambique 47; United Kingdom 17.
Blister	2,286	2,581	Zambia 2,572.
Refined, unwrought	6,008	3,842	Belgium-Luxembourg 1,855; United Kingdom 642.
Master alloys	11	14	United Kingdom 13.
Semimanufactures	5,561	6,836	United Kingdom 1,949; Italy 1,028; West Germany 968.
Gold, bullion and semimanufactures, troy ounces	170	791	Belgium-Luxembourg 775.
Iron and steel:			
Iron ore including roasted pyrites	78,598	57,123	Brazil 53,109.
Iron oxides and hydroxide	1,264	1,307	Spain 664; West Germany 508.
Scrap	4,671	4,314	United Kingdom 1,800; Portuguese West Africa 1,325; United States 603.
Pig iron and ferroalloys [1]	1,816	4,284	West Germany 1,632; United Kingdom 1,226.
Steel ingots and other primary forms [2]	5,882	23,136	West Germany 15,323; United Kingdom 4,845.
Semimanufactures:			
Shapes	69,852	62,521	Belgium-Luxembourg 17,306; West Germany 16,024; France 11,224.
Plates and sheets:			
Uncoated	124,614	124,112	West Germany 37,534; Belgium-Luxembourg 31,034; France 25,119.
Tinplate	52,749	63,517	France 22,082; United Kingdom 19,255.
Other coated	11,836	13,300	Belgium-Luxembourg 8,200; France 2,443.
Hoop and strip	38,495	35,111	Belgium-Luxembourg 14,081; France 10,605; West Germany 4,145.
Railway track material	5,662	3,590	Belgium-Luxembourg 1,611; West Germany 877; United Kingdom 720.
Wire	15,541	14,253	United Kingdom 4,933; Belgium-Luxembourg 4,584; West Germany 1,840.
Tubes, pipes, and fittings	10,328	12,544	West Germany 5,571: France 1,793; Italy 1,597.
Rough castings and forgings	463	509	United Kingdom 293; West Germany 107.
Lead and alloys:			
Oxides	9	13	West Germany 7.
Scrap	74	133	Gibraltar 74; Mozambique 32.
Unwrought and semimanufactures	6,846	8,455	Republic of South Africa 4,171; Peru 2,792.
Magnesium, all forms	9	6	United Kingdom 5.
Manganese:			
Ore and concentrate	239	308	United Kingdom 187; Japan 35.
Oxides	84	37	Netherlands 20.
Mercury:			
Oxides, kilograms	800	200	Nearly all from Spain.
Metal, 76-pound flasks	249	763	All from Spain.
Molybdenum, all forms, kilograms	400	5,100	United Kingdom 4,800; West Germany 100.
Nickel, all forms	254	301	United Kingdom 164; West Germany 106.
Platinum and platinum-group metals, troy ounces	r 9,110	3,632	United Kingdom 2,707; West Germany 890.
Silver, all forms, thousand troy ounces	727	436	United Kingdom 357; West Germany 68.
Tin:			
Oxides, long tons	22	16	United Kingdom 15.
Metal, all forms, do	25	17	United Kingdom 12.

See footnotes at end of table.

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Table 3.—Portugal: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Titanium:			
Ore and concentrate, rutile	346	558	Australia 557.
Oxides	2,192	2,433	United Kingdom 883; West Germany 572; Finland 459.
Tungsten, all forms kilograms	100	200	United Kingdom 100.
Vanadium, zirconium and other titanium ores.	127	495	Australia 304; United Kingdom 136.
Zinc and alloys:			
Zinc oxides	296	286	West Germany 148; Belgium-Luxembourg 60.
Scrap	258	-------	
Unwrought	5,849	5,086	Belgium-Luxembourg 2,526; France 1,808.
Semimanufactures	256	285	West Germany 120; France 100.
Nonferrous base metals, n.e.s	120	159	West Germany 78; China (mainland) 30; United Kingdom 26.
Nonmetals:			
Abrasives:			
Natural:			
Dust and powder from gem stones thousand carats	316	5	United Kingdom 3; Belgium-Luxembourg 2.
Diatomite	1,517	1,597	United States 673; West Germany 241; France 239.
Pumice and other natural	790	610	Italy 249; Netherlands 207.
Manufactured:			
Corundum, artificial	414	495	West Germany 323; France 141.
Grindstones and whetstones	224	218	United Kingdom 87; West Germany 42
Asbestos	3,878	4,097	Canada 1,754; Republic of South Africa 1,066; Mozambique 554; Southern Rhodesia 501.
Barite	201	235	West Germany 167; United Kingdom 22.
Boric oxide and acid	127	133	France 67; United States 47.
Cement, hydraulic	809	915	France 608; United Kingdom 126.
Chalk	1,500	1,818	France 1,016; Belgium-Luxembourg 680.
Clays, clay products and refractory products, n.e.s.:			
Crude:			
China clay	273	453	United Kingdom 172; United States 157; Netherlands 101.
Bentonite	1,605	2,056	Morocco 860; United States 834; Mozambique 220.
Other	2,682	3,801	United Kingdom 2,624; Spain 470.
Construction materials:			
Bricks and other nonrefractory	286	882	Sweden 390; Spain 175; United Kingdom 171.
Refractory	5,040	7,695	Austria 1,905; Morocco 1,687; West Germany 1,400.
Cryolite and chiolite	46	33	Denmark 30.
Dolomite	3,564	3,480	Spain 1,991; Italy 892.
Feldspar	641	946	West Germany 309; Spain 220; France 121; Republic of South Africa 121.
Fertilizer materials:			
Natural:			
Animal or vegetable, crude	389	219	All from France.
Sodium nitrate	231	150	West Germany 140.
Phosphate rock	274,978	223,934	Morocco 223,286.
Manufactured:			
Nitrogenous	7,165	1,076	West Germany 927.
Phosphatic:			
Basic slag	10,639	10,109	Belgium-Luxembourg 9,859; France 249.
Other	1,383	1,048	France 848.
Potassic	33,880	23,127	Spain 23,087.
Mixed	23,100	20,757	West Germany 16,019; Italy 3,738.
Graphite, natural	132	144	West Germany 56; Norway 34.
Gypsum and anhydrite	14,244	15,633	Morocco 15,565.
Magnesite	249	1,033	Austria 645; Netherlands 236.
Mica, crude and scrap	147	87	Norway 59.
Mica products	10	41	West Germany 34.
Mineral pigments	107	176	France 99; Belgium-Luxembourg 35; Austria 30.
Quartz and quartzite	1,350	1,858	Belgium-Luxembourg 1,679.
Salt	28,063	20,650	Cape Verde Islands 17,285; Angola 3,173.
Sand	3,170	5,200	Netherlands 3,190.

See footnotes at end of table.

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Table 3.—Portugal: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Stone:			
Dimension stone	52	419	France 378.
Flint and crushed stone	1,737	594	Belgium-Luxembourg 425.
Sulfur, elemental, all types	54,727	34,274	France 32,536, West Germany 1,607.
Talc and soapstone	1,950	1,926	Norway 1,026; France 408.
Crude nonmetallic minerals, n.e.s	4,536	1,975	Cape Verde 1,695; Republic of South Africa 141.
Mineral fuels			
Asphalt and bitumen, natural	3,064	1,238	Belgium-Luxembourg 578; Spain 544
Carbon black	4,236	4,500	France 1,741; Netherlands 736; West Germany 432.
Coal and coal briquets. thousand tons	428	470	Poland 258; United States 118; United Kingdom 63.
Coke from coal do	217	290	United Kingdom 149; Netherlands 51; West Germany 49.
Coal distillation products	6,835	7,994	Netherlands 2,668; Italy 1,911; United Kingdom 1,670.
Petroleum:			
Crude thousand tons	1,717	1,557	Iraq 1,166; Bahrein 391.
Refinery products:			
Gasoline	91	102	Spain 32; Netherlands Antilles 31; Belgium-Luxembourg 22.
Kerosine, white spirit, jet fuel. thousand tons	23	26	Netherlands Antilles 23.
Distillate fuel oil do	334	323	Netherlands Antilles 113; Italy 68; Iran 55.
Residual fuel oil do	302	288	Mozambique 108; Angola 45; Netherlands 40.
Lubricants do	48	49	United Kingdom 19; Netherlands 13.
Mineral jelly and waxes	3	4	United States 2; France 1; United Kingdom 1.
Nonlubricating oils, n.e.s	8	7	Netherlands 4; France 2.
Pitch coke and bituminous mixtures	9	6	United Kingdom 4; Italy 1; Spain 1.
Petroleum and shale oil wastes	26	42	Spain 20; Netherlands Antilles 16.
Liquid petroleum gases	89	105	France 88; Italy 12; Netherlands 4.

r Revised.
1 Includes powder, shot, and sponge.
2 Includes coils for rerolling.

COMMODITY REVIEW

METALS

Iron ore.—During 1967 the Minacorvo Mine Exploration and Development Company (Minacorvo-Exploracao e Desenvolvimento Mineiro de Moncorvo, Ltd.) conducted metallurgical research on hematitic iron ore from the Moncorvo deposit which was estimated to contain about 800 million tons of measured and possible reserves with an iron content of 39 to 42 percent. Construction was scheduled to begin in early 1969 on a plant designed to produce 2 million tons annually of pellets containing 65 percent iron (Fe), with the possibility of later expansion of capacity to 4-million tons annually. The pellets will be destined to supply the National Steelworks (Siderurgica Nacional S.A.R.L.) at Seixal with 400,000 tons (later 800,000 tons) annually, and will also provide quantities for export to West Germany. The Portuguese company is a subsidiary of the Thyssen Group, West Germany's largest steel producer, with works in the Ruhr District.

Uranium.—According to data released by the Portuguese Atomic Energy Board early in 1967, measured uranium ore reserves were estimated at 5.338-million tons with a recoverable uranium oxide (U_3O_8) content of 8,665 metric tons distributed geographically as follows: Niza 43 percent, Viseu 40 percent, Guarda 17 percent, and minor reserves in Moncorvo.

MINERAL FUELS

Petroleum.—In late 1967, the Government of Portugal published official regulations governing petroleum exploration in metropolitan Portugal, including the continental shelf. Under Decree No. 47,972 dated September 30, 1967, published in

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Diario do Governo Series I No. 229, the continental shelf is divided into blocks having a length of 6 minutes longitude and a width of 5 minutes latitude (except where reaching the coast line) the areas varying from 75 to 80 square kilometers. Permits for exploration concessions comprising a maximum of 12 blocks each are obtained through the Secretary of State for Industry (Secretario do Estado da Industria). Individual companies may hold several concessions. The Government's fees or charges for concessions have been established at 4,000 Escudos ($139.13) per square kilometer for the first year, increased by 2,000 Escudos ($69.56) each year thereafter until a maximum of 20,000 Escudos ($695.56) is reached and continues at that level for the duration of the concession.

In August 1967 it was reported through Belgian sources and the Portuguese News Service that a loan of 400 million Belgian francs ($8 million) was being negotiated, proceeds of which would be used to improve the Sacor refinery at Leixos and to construct, at Oporto, a new refinery with a capacity of 2 million tons annually.

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The Mineral Industry of Southern Rhodesia

By E. Shekarchi [1]

Based on the $93.5 million [2] reported value of mineral production in 1967, the mineral industry of Southern Rhodesia seemed to have at least maintained its overall level of activity, although there was evidence of the effect upon individual commodities of economic sanctions imposed by the United Nations Security Council in December 1966. Details on activities of the nation's industry have been difficult to obtain since the Government's declaration of independence in 1965 and its subsequent restriction on official publication of specific data on mineral production, international trade, and related topics. However, corporate reports and various professional journals have continued to provide numerous items of general information and some few statistics reflecting production and trade practices. Most of the information in this chapter thus, of necessity, has been derived from unofficial sources, and is without official verification, but it is believed to be reasonably reliable.

According to reports published in the Standard Bank Review of London, May 1968, the gross national product of Southern Rhodesia increased by more than 8 percent to $1,083 million in 1967, as compared with $997.4 million in 1966 and $1,020 million in 1965. Most sectors of the economy contributed to this growth; for instance, the value of mining output in 1967 rose to a new peak of $93.5 million compared with $91.2 million in 1966, an estimated $87.9 million in 1965, and $74.8 million in 1964. The value of building and construction works in 1967 increased by 9 percent to approximately $98 million.

The most significant single event in 1966 and 1967 affecting the mineral industry and the whole economy of the nation as well, was the December 16, 1966, passage of a U.N. Security Council resolution to impose selective mandatory economic sanctions on Southern Rhodesia. Under this resolution, member nations were to refrain from importing selected Southern Rhodesian products, including, among mineral commodities, asbestos, iron ore, chromite, pig iron, and copper. Moreover, member nations were to make efforts to deny to Southern Rhodesia certain commodities which it must import, the most notable of which are petroleum and its products. Portugal and the Republic of South Africa failed to conform to the resolution.

According [3] to the President of the Chamber of Mines, increased mining costs, the most serious problem facing the industry, stemmed from fixed prices in Southern Rhodesia, inflation in countries supplying the bulk of mining equipment and material, import controls which forced importers to increase markups, and, finally, sanctions.

In his 1967 annual address, the President of the Chamber of Mines stated that despite a reasonable amount of mechanization, the country's mining industry was still basically a labor-intensive industry. In 1965, about 43,000 persons were employed in the industry, over 95 percent native Africans.

The Public Sector Investment Program for 3 years (1967 to 1970) provides for an expenditure of about $204.4 million, largely allocated to economic services, in-

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[1] Foreign mineral specialist, Division of International Activities.

[2] Where necessary, values have been converted from Rhodesian pound (RP) to U.S. dollars at the rate of RP1=US$2.80.

[3] The Chamber of Mines Journal. V. 10, No. 4, April 1968, p. 24.

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cluding development of transportation and agriculture.

Legislation acted upon in 1966 and 1967 that had or will have some effect on the mining industry included: The Apprenticeship Training and Skilled Manpower Development Act which placed emphasis on developing skilled manpower, protecting skilled trades, and training apprentices; The Gold Mining Amendment Act which provided subsidy coverage to additional producers; and The new Explosive Act which emphasized improved security that was lacking in the old law.

PRODUCTION

While there have been no Government-issued production data since 1965, some companies have reported output of selected commodities. On the basis of these reports, together with general press accounts of Southern Rhodesia's economic performance, and reflections (in other countries' import statistics) of output of commodities destined chiefly for the export market, reasonable estimates of production for most major commodities for 1966 and 1967 were derived. In general, it is indicated that through yearend 1967, output of most major commodities was little affected by the voluntary economic sanctions imposed up to December 1966, and possible effects of the more stringent mandatory sanctions imposed at that time were not obvious, at least by yearend 1967. The lack of effect of the earlier sanctions on productive performance, if not upon sales, was evidenced by the 2.5-percent growth in mineral output value to $93.5 million in 1967, and was emphasized by a statement attributed to the Secretary of Mines that "It is no secret that 1966 broke . . . (the 1965 mineral production) . . . record." [4]

Output of bauxite, fluorspar, kaolin, limestone, phosphate rock, and silica sand, all produced chiefly or wholly for local markets, have been postulated on a presumed relative stability or expansion of activity by Southern Rhodesian consumers. Output of beryl, asbestos, barite, corundum, and magnesite have been estimated on the basis of definitively reported and indicated imports by traditional recipients. Details on formulation of chromite, copper, gold, iron ore, iron and steel, tin, coal, and coke estimates are given under the respective commodities; the estimate for silver production is based on copper and gold output, with which it is recovered as a byproduct.

[4] U.S. Consulate, Salisbury, Southern Rhodesia. State Department Airgram A-211, Apr. 26, 1968, 6 pp.

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Table 1.—Southern Rhodesia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966 e	1967 e
Metals:					
Antimony, content of concentrate	60	44	e 185	NA	NA
Arsenic, white	549	187	e 65	NA	NA
Bauxite	1,842	2,478	2,000	2,000	2,000
Beryl	226	165	1 92	1 65	1 43
Cesium mineral: Pollucite	-------	24	NA	NA	NA
Chromite	374,116	447,576	e 566,500	2 500,000	2 500,000
Copper:					
Mine, content of ore and concentrate	16,773	16,639	17,962	2 15,100	17,400
Smelter, fire-refined copper	14,685	15,239	r 17,273	17,100	17,100
Gold, troy ounces	566,277	575,386	544,100	550,000	550,000
Iron and steel:					
Iron ore, thousand tons	655	824	e 1,360	1,300	2 700
Pig iron, do	236	318	250	260	2 200
Ferroalloys, ferrochrome (exports), thousand tons	14	23	r 21	3 11	NA
Steel ingots and castings, do	84	128	130	130	130
Manganese ore	-------	145	e 206	NA	NA
Nickel, content of concentrate	119	157	e 700	700	700
Silver, troy ounces	83,742	88,463	e 95,470	95,000	95,000
Tantalum concentrate	69	64	e r 35	e 27	NA
Tin:					
Mine, content of concentrate, long tons	498	512	510	600	500
Smelter, do	499	511	494	480	500
Tungsten ore and concentrate, 60 percent WO_3	3	---------	28	NA	NA
Nonmetals:					
Asbestos	129,051	139,208	159,800	160,000	2 150,000
Barite	1,772	1,416	e 1,400	2,000	2,000
Cement e, thousand tons	250	250	250	NA	NA
Corundum	5,389	2,604	e 4,200	4,200	4,200
Diatomite, including tripoli	273	315	e 480	e 480	NA
Feldspar	-------	-------	e 170	NA	NA
Fire clay	13,180	12,455	13,274	13,000	13,000
Fluorspar	311	70	e 150	150	150
Kaolin	11,104	19,051	r 20,000	20,000	20,000
Kyanite	54	233	NA	NA	NA
Limestone	533,173	540,251	r 540,000	540,000	540,000
Lithium minerals:					
Amblygonite	47	---------	---------	NA	NA
Eucryptite	1,056	731	e 640	NA	NA
Lepidolite	14,657	20,814	e 16,100	NA	NA
Petalite	27,167	33,066	e 27,100	NA	NA
Spodumene	2,028	6,319	e 13,900	NA	NA
Magnesite	10,947	38,474	e 35,600	30,000	40,000
Mica:					
Block	7	34	29	NA	NA
Crude and scrap	102	71	82	NA	NA
Phosphate rock	-------	1,995	e 3,600	e 10,000	4 10,000
Pyrite	66,100	82,431	e 82,000	NA	NA
Quartz	19,054	28,311	NA	NA	NA
Quartzite	200	181	NA	NA	NA
Semiprecious stones 5, kilograms	2,989	4,217	NA	NA	NA
Silica sand	2,021	3,268	3,000	3,000	3,000
Talc	19	14	e 82	NA	NA
Mineral fuels:					
Coal, bituminous, thousand tons	2,740	3,044	6 3,038	6 5,057	6 3,060
Coke, do	92	130	6 174	6 203	6 205

e Estimate. r Revised. NA Not available.

1 U.S. imports.

2 Conjectural.

3 Partial figures; imports from Southern Rhodesia by Australia, Austria, Belgium-Luxembourg, Canada, France, West Germany, Italy, Japan, Sweden, and the United States.

4 Concentrate containing 41 percent P_2O_5.

5 For distribution of total by type, see Bureau of Mines Minerals Yearbook, Volume I–II, 1967, p. 1226.

6 Sales during year ending August 31 of that stated.

TRADE

As in the case of production, no official records of Southern Rhodesian trade in mineral commodities have been published since 1965. Fragmentary information on Southern Rhodesia's exports and imports in 1966 has been derived from trade

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returns of selected partner countries. However, because such data are far from a complete measure of Southern Rhodesia's trade, tables 2 and 3 give official Southern Rhodesian data for 1964 and 1965.

In 1965, Rhodesian sources recorded mineral commodity exports (including reexports) valued at nearly $137.3 million, or 29.8 percent of total exports and reexports, and mineral commodity imports valued at nearly $53.2 million, or 15.8 percent of total imports. The obviously partial figures derived from other nations' import trade returns for 1966 listed mineral commodities of Rhodesian origin valued at only $33.2 million and shipments of mineral commodities to Southern Rhodesia valued at only $7.9 million; notably, trade with the Republic of South Africa and Mozambique are not included in these partial figures.

Recorded imports of mineral commodities from Southern Rhodesia by other countries in 1966 included, among others, the following more significant items:

Commodity	Quantity (metric tons)
Copper:	
Concentrate	926
Ingot	2,285
Bar and rod	75
Iron and steel:	
Iron ore	292,481
Pig iron	154,107
Ferrochrome	11,449
Nickel ore and concentrate	3,888
Tin, ingot	54
Asbestos	51,713

Recorded mineral commodity exports of other countries to Rhodesia in 1966 included the following:

Commodity	Quantity (metric tons)
Semimanufactures:	
Aluminum	317
Copper	54
Steel	8,327
Fertilizers:	
Nitrogenous	93,087
Phosphatic	5,900
Potassic	17,808
Mixed	3,039
Petroleum: Lubricants, jelly and waxes	460

Even more limited information on 1967 trade, obtained in the same manner, included Japanese imports of 82 tons copper concentrate, 131 tons of copper matte, and 1,812 tons of nickel ore and concentrate. These quantities were appreciably lower than 1966 Japanese receipts and may well be material that was in transit before the late 1966 sanction imposition. Also, notably, Japan recorded no imports of iron ore, pig iron, or asbestos in 1967, commodities which in 1966 had been received in sizable tonnages from Southern Rhodesia. The United States, which for 1966 listed imports for consumption of 4,738 tons of Rhodesian low-carbon ferrochromium and 164,000 tons of Rhodesian chromite, recorded no ferrochromium receipts and only 133,000 tons of chromite in 1967; the latter represented receipt of material already in port stockpiles outside Southern Rhodesia when sanctions were invoked.

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Table 2.—Southern Rhodesia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal destinations, 1965
Metals:			
Antimony concentrate	164	211	United States 152; Belgium 59.
Beryllium ore and concentrate	144	86	All to United States.
Chromium ore and concentrate	455,673	635,089	United States 309,666; Republic of South Africa 186,186; Japan 38,546; United Kingdom 25,240.
Copper:			
Concentrate	7,135	6,978	Republic of South Africa 5,686; Japan 1,138.
Refined, unwrought	15,403	16,731	West Germany 10,241; Poland 1,731; Italy 1,587; United Kingdom 1,472.
Bar and rod and copper alloys	3,792	1,640	Malaya 1,291.
Gold value, thousands	[1] $19,832	[1] $19,023	NA.
Iron and steel:			
Iron ore	286,571	321,344	Japan 318,865.
Pig iron	218,396	214,432	Japan 207,513.
Ferrochrome	22,700	21,326	United Kingdom 7,720; Australia 2,551; Sweden 2,550.
Iron and steel scrap	3	31	NA.
Iron and steel billets, ingots, equivalent forms.	33,958	23,213	Republic of South Africa 22,498.
Semimanufactures:			
Bars, rods, angles, shapes	11,235	26,088	Zambia 19,071; Congo (Kinshasa) 2,556.
Other	9,300	7,230	Zambia 4,544; Malawi 1,024.
Total	20,535	33,318	
Silver, bullion troy ounces	96,280	83,285	United Kingdom 81,568.
Tantalum, ore and concentrate	75	34	United Kingdom 17; United States 10.
Tin:			
Ore and concentrate long tons	54	71	All to Netherlands.
Ingot do	473	399	Republic of South Africa 393.
Tungsten, ore and concentrate	------	26	United Kingdom 24.
Metallic ores concentrate, etc. not further described. value, thousands	$127	$902	Japan $833.
Nonferrous metal scrap	3,960	2,529	Republic of South Africa 1,195; West Germany 256.
Nonferrous metals not further described. value, thousands	$314	$422	Malawi $158; Zambia $157; Republic of South Africa $67.
Nonmetals:			
Asbestos	161,316	167,406	United Kingdom 38,818; West Germany 15,619; Republic of South Africa 15,183.
Barite	1,539	1,875	All to Republic of South Africa.
Cement	5,843	14,576	Zambia 11,468; Bechuanaland 2,008.
Corundum	3,020	3,260	Republic of South Africa 1,601; United States 1,291.
Fertilizer materials, manufactured	22,958	33,356	Zambia 29,289; Malawi 3,406.
Lithium ores	67,389	50,733	United States 15,326; Belgium 14,972; United Kingdom 6,510.
Magnesite	23,770	34,102	Republic of South Africa 34,086.
Quartz, mica, feldspar, fluorspar	352	2,854	Libya 1,154; Norway 363; West Germany 254.
Crude minerals not further described. value, thousands	$74,698	$530,128	Republic of South Africa $207,970; Zambia $207,385.
Mineral fuels:			
Coal, bituminous thousand tons	1,342	1,634	Zambia 1,157; Congo (Kinshasa) 52.
Coke do	105	146	Zambia 60; Congo (Kinshasa) 52.
Petroleum refinery products:			
Asphalt and bitumen	1,937	4,412	Zambia 4,384.
Mineral fuels and related materials not further described. value, thousands	$123	$5,807	Zambia $5,600.
Electric energy value, thousands	$11,836	$12,410	All to Zambia.

NA Not available.
[1] Net sales.

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Table 3.—Southern Rhodesia: Imports of mineral commodities.

(Metric tons unless otherwise specified)

Commodity	1964	1965		
		Total	Sources	
			Republic of South Africa	Principal sources except Republic of South Africa
Metals:				
Aluminum:				
Semimanufactures	711	962	684	United Kingdom 176.
Aluminum and alloys not further described.	219	237	110	United Kingdom 84; Israel 35.
Copper and copper alloys, all forms	6,519	4,283	625	Zambia 3,262; United Kingdom 62.
Iron and steel:				
Pig iron	377	199	198	
Ferroalloys	1,186	1,395	1,352	
Iron and steel ingots	74	67	29	United Kingdom 36.
Semimanufactures	99,991	95,564	48,590	United Kingdom 13,230; Japan 11,537.
Lead and lead alloys, all forms	753	851	17	Zambia 784; Malawi 45.
Nickel and nickel alloys, all forms	17	49	46	
Tin and tin alloys, all forms_long tons	79	77	32	United Kingdom 42.
Zinc and zinc alloys, all forms	111	774	40	Zambia 609; Congo (Kinshasa) 122.
Nonferrous metals not further described	81	136	61	Belgium 34; United Kingdom 23.
Metalliferous ores and metal scrap. value, thousands	$646	$510	$44	Zambia $294; Mozambique $118.
Nonmetals:				
Abrasives, wheels, disks, etc	182	181	129	United Kingdom 32.
Bricks, refractory_number, thousands	1,283	1,034	844	Austria 143.
Cement:				
Hydraulic	3,587	1,464	286	Zambia 812; United Kingdom 330.
Fire and furnace	904	619	441	United Kingdom 170.
Fertilizer materials:				
Crude, not further described	84,009	69,208	403	Senegal 65,267; Chile 3,538.
Manufactured:				
Nitrogenous:				
Ammonium sulfate	56,999	66,142	44	Netherlands 34,797; West Germany 26,041.
Urea	23,953	37,918	------	Netherlands 19,944; Norway 5,280; Italy 4,028.
Other nitrogenous	65,937	80,863	5	United States 29,056; Belgium 18,585; West Germany 10,835; Netherlands 10,692.
Phosphatic:				
Superphosphate	5,827	2,417	2,414	
Other, not further described.	6,189	10,982	1,023	United States 8,466.
Potassic	38,246	29,811	2	France 14,153; West Germany 11,437.
Other, not further described	1,068	243	21	United States 73; United Kingdom 25.
Gypsum and plaster of paris	9,426	7,878	7,708	United Kingdom 94.
Potash compounds other than fertilizers.	239	193	36	Sweden 56; West Germany 43; United Kingdom 19.
Salt	29,772	40,026	25,033	Angola 8,484.
Mineral fuels:				
Solid fuels, coal and coke	12,650	10,035	10,035	
Petroleum:				
Refinery products:				
Gasoline thousand 42-gallon barrels	1,358	521	2	Iran 382; Bahrain 127.
Kerosine_____do	510	348	(2)	Iran 259; Bahrain 57; Aden 29.
Distillate fuel oil_____do	1,121	351	(2)	Iran 217; Saudi Arabia 89; Bahrain 44.
Residual fuel oil_____do	7	1	------	All from Iran.
Lubricating oils_____do	92	103	85	United States 7.
Lubricating greases	1,139	1,246	793	United States 441.
Jellies and waxes	2,391	2,233	61	Indonesia 1,330; United States 442; West Germany 292.
Asphalt and bitumen	15,289	5,418	3,958	Iran 937.
Petroleum oils not further described. ___do	7,721	8,828	513	United States 2,638; United Kingdom 2,089; West Germany 1,816.
Petroleum products not further described. value, thousands	$91	$6,690	$14	Iran $6,529.

NA Not available.

[1] According to Diario de Mozambique, Beira, Mozambique, May 3, 1966, the equivalent of 4,186,000 barrels of crude petroleum was pumped from Beira to Umtali, Southern Rhodesia, from January 1965 to November 1965, when pumping ceased.

[2] Less than ½ unit.

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COMMODITY REVIEW

METALS

Chromite.—Rhodesian sources reported that chromite production was continuing despite the United Nations' mandatory sanctions on receipt of Rhodesian chromite by member nations; moreover, these sources at least intimated that output levels were not appreciably reduced. However, it was announced that certain of the Great Dyke properties of Rhodesia Chrome Mines Ltd. (Union Carbide) would be placed on a care and maintenance basis. Although the installations to be affected were not reported, it was elsewhere indicated that emphasis at some properties was on open-cast operations.

Copper.—Information contained in reports of Southern Rhodesia's only significant copper producing group, the Messina (Transvaal) Development Company (of the Republic of South Africa) and its Rhodesian subsidiaries, indicated that Southern Rhodesia's total mine copper output in 1967 advanced after a modest decline in 1966. Moreover, despite lower unit prices received for cement copper in 1967 than in the past, an increase in output of that commodity was foreseen for 1968. The copper contained in cement copper leached from oxide ores during 1966 and 1967 was about 25 percent of total Messina group mine copper output, the remaining 75 percent was contained in concentrates produced from sulfide ores from several mines.

Reports in the press suggest that Southern Rhodesia's copper mine potential may be higher than heretofore thought; there were indications that the main copper-bearing formation of Africa, from which the Congo (Kinshasa) and Zambia recover their output, may extend southward across western Southern Rhodesia and on into Botswana.

Lending credence to this idea was the discovery during 1967 of what may prove to be a major copper-nickel deposit near the Botswana border by Roan Selection Trust Ltd. (RST). This aroused considerable interest in mining and Governmental circles in Salisbury.

Apparently, the Messina group has undertaken intensive geological investigations for copper ore near the Gwaai River in the Wankie district of western Southern Rhodesia. At the Ell mine, boreholes reportedly intersected 2.5 percent ore in four widely separated ore bodies.

There were no indications of the progress made in 1967 in efforts to establish a number of so-called "one-man" copper mines. This project was launched in 1966 on the premise that such mines would bring in more national earnings than would several small gold mines.

Looking to the immediate future of the copper mining industry, the Deputy Minister of Mines indicated that progress was being made toward a goal of a 30,000-ton-per-year national metallic copper output, a target at which he considered that an electrolytic refinery would be economic, and a goal which he felt might be reached in 1969.

Gold.—Southern Rhodesia in 1967 reportedly retained seventh place among world gold producers despite problems of rising costs and diminishing reserves. The Gold Mining Amendment Act provided for government subsidy payments to mines with large reserves of subeconomic grade ore; previously assistance was authorized only for potentially viable mines.[5]

Iron and Steel.—Available information on other countries' receipts of Rhodesian iron ore and pig iron, together with indications of Rhodesian use of iron and steel suggest that, in all probability, iron ore output in 1966 was about on a par with that of 1965, and that it declined in 1967, unless appreciable stocks were developed. Import statistics of other countries for 1966 record receipts of 292,481 tons of iron ore (all by Japan) and 154,107 tons of pig iron (equivalent to almost 270,000 tons of ore); these figures are almost certainly incomplete. In 1967 however, no iron ore receipts were recorded by Japan (the principal recipient in all recent, previous years) and only 20,300 tons of Rhodesian pig iron was recorded among U.S. imports. (A number of countries recorded pig iron imports from Southern Rhodesia in 1966 with the United States, with 65,920 tons, heading the list.)

There was no indication of reduction in domestic demand for locally produced

[5] Mining Journal (London). Mining Annual Review, 1968 edition. May 1968, p. 293.

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iron and steel in 1966 or 1967, and in fact, it may have increased owing to trade restrictions arising from the sanctions imposed in December 1966. The country's sole producer, Rhodesian Iron and Steel Co. Ltd. (Risco), reportedly supplied all the country's basic and foundry pig iron in 1967, and manufactured most of the steel required for construction work. In 1965, this firm reportedly consumed 582,055 tons of iron ore (the type of ton not specified).

In 1966, Ripple Creek Mining Co., a subsidiary of Risco, was formed to supply iron ore and some manganiferous ore from a new deposit 16 kilometers from Risco's plant. The new company also will explore for additional raw materials.

Nickel.—In spite of sanctions then imposed, Anglo-American Corp. of South Africa Ltd. announced in 1966 that it planned to expand operations in Southern Rhodesia. The expenditure included about $8.4 million to expand the existing Trojan nickel mine, $8.4 million to open the new Madziwa mine at Shimva, and $9.8 million to build a smelter and refinery. When the two mines north-northeast of Salisbury attain full production, annual company output will total 7,500 long tons of contained nickel. Production was planned to begin at the Trojan in 1968 and at the Madziwa in 1969.

Since the Anglo-American Corp. purchased the Trojan property at a cost of $11.2 million, drilling has indicated ore reserves totaling about 10 million metric tons at an average grade of 0.954 percent nickel. Further exploration was being carried out in the Trojan mine area as well as in the Shamva district, where Madziwa's two ore bodies still must be delineated and evaluated fully.

When in full operation, the Anglo-American Corp. installations will employ about 525. The new mill will treat 350,000 tons of ore annually for the first 2 years of operation and 600,000 tons thereafter.

Plans were also made for extensive development of the Empress copper-nickel prospect, 40 kilometers west of Gatooma, and controlled by a subsidiary of the Rio Tinto Company, Ltd. of South Africa. A small pilot plant was in operation at this property through 1957 when activities were suspended. The proposed development, financed by a $1.2 million issue of 6½ percent notes redeemable in 1975, calls for monthly ore output of 60,000 tons.

A reported discovery of copper and nickel showings near the Botswana border by Roan Selection Trust Ltd. (RST) was also of possible future significance; no technical details were released.

Tin.—The Kamativi Tin Mines, Ltd., operation, described as the biggest underground tin workings in Africa, completed a shaft at the property east of Wankie near the Zambian border at a cost of $840,000. The 50,000-ton-per-month-capacity mill reportedly became operational in 1966. Southern Rhodesia's smelter industry, which has produced annually about 500 tons of metal, formerly depended upon Zambian concentrates for a large part of its raw material. Apparently the new mill will make possible continued smelter operations. Normal domestic tin demand, as of 1965, was about 150 tons per year.

NONMETALS

Asbestos.—The Ethel mine, about 100 kilometers northwest of Salisbury, closed in October 1966 after 15 years' operation owing to technical difficulties and increasing costs. This relatively small producer was the only asbestos mine on the Great Dyke. Activities of other producers, most of whom are located near Shabani, Mashaba, and Filabusi, remained unreported; available information on 1966 receipts of Rhodesian asbestos by other countries suggests that shipments declined considerably. Recorded imports of Rhodesian asbestos by other countries totaled only 51,713 tons in 1966 compared with total Rhodesian exports of 167,406 tons in 1965, but several thousand additional tons may have been exported to the Republic of South Africa, which recorded a sizable import from unspecified sources in 1966.

Fertilizer Materials.—*General.*—It was announced in 1967 that Sable Chemical Corp. would start construction of a large fertilizer plant at Que Que. The facility's main product will be nitrogenous fertilizer, with first output expected in 1969. This project, to cost about $47.6 million, is the largest single industrial development to be started in Rhodesia since its declaration of independence. The company is

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to receive Government protection for a 10-year period in return for accepting a sliding scale of fertilizer prices for this period. The location of the fertilizer plant at Que Que suggests the use of material from the nearby coke plant of Risco as feedstock.

Phosphates.—Apatite-bearing deposits of volcanic origin near Dorowa reportedly are adequate to meet Southern Rhodesia's needs for phosphatic raw materials, and at least under prevailing conditions, seem to have proven economically exploitable. A beneficiation plant, with an estimated annual capacity of about 10,000 tons of product containing 41 percent P_2O_5, began operation in 1965 to furnish feedstock for the Rodia fertilizer plant, and by early 1968 it was reported in a publication, *Mining in Rhodesia,* 1968, that Rhodesian superphosphate output was being derived entirely from domestic raw materials.[6] This included the necessary sulfuric acid, which was being produced from pyrite mined domestically. On the basis of this report, and indications of declining superphosphate imports in 1965, mine-beneficiation plant output at capacity levels has been postulated.

Fluorspar.—Metallurgical grade fluorspar for domestic use was obtained from a deposit at Tinde in the Wankie District. About 2,000 feet of a 10,000-foot strike length of fluorspar-bearing ground has been opened, and an average width of 17 feet was reported.[7]

Graphite.—Reportedly, commercial production of graphite was achieved for the first time in 1967.[8] Although further information was not given in this announcement, it is probable that this output originated from a mine in the Karoi area, controlled by West German and Rhodesian interests, that was being developed in 1966.

Magnesite.—A new magnesite mine was reportedly opened in 1967. Location and ownership were not reported, and the presence of unexploited magnesite deposits in a number of areas makes it impossible to ascertain the exact location. Presumably, the opening of this mine indicates possible increased deliveries to the Republic of South Africa, the traditional principal destination for the greatest part of total Rhodesian magnesite output.

Mica.—Without providing details. Rhodesian sources indicated that the nation's mica industry was experiencing a slump, but suggested that output from known deposits could be increased considerably if economic conditions permitted, and that the potential for discovery of valuable new deposits remained.

MINERAL FUELS

Because of rapidly increasing power requirements and restrictions on petroleum imports resulting from the United Nation's economic sanctions, Southern Rhodesia was examining possible ways of increasing power availability in the country. Alternatives considered included increasing coal output at Wankie colliery, increasing hydroelectric output of Kariba dam, commencing coal production at the Sabi coalfields, and developing the Cabora-Bassa hydroelectric scheme.

The mineral industry remained by far the largest electric power consumer in Southern Rhodesia in 1967; mining alone used 38 percent of total power produced, and associated processing industries raised the mineral industry total to over 50 percent.

Coal.—According to the annual journal, *Mining in Rhodesia,* 1968, there are 14 known Rhodesian coal deposits, but only one, owned by Wankie Colliery Co. Ltd., was being mined in 1967. The ash content of Wankie coal is reportedly lower than that of other Rhodesian deposits, and its output reportedly is satisfactory for much of the nation's needs. Nevertheless, Risco, the country's only steel producer, has indicated a preference for higher quality coking coal than Wankie apparently can supply; and the nation's ferroalloy industry evidently has continued to rely upon imports from the Republic of South Africa for its high quality coking coal requirements.

Although output of coal and coke have not been officially reported since yearend 1964, it is believed that Wankie colliery sales of these commodities serve as a reasonable gage of national output levels.

Shipments of coal to Zambia on a more or less emergency basis to main-

[6] U.S. Consulate, Salisbury, Southern Rhodesia. State Department Airgram A-211, Apr. 26, 1968, 6 pp.
[7] Work cited in footnote 5.
[8] Page 4 of work cited in footnote 6.

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tain copper-belt smelter output reportedly averaged 40,000 tons monthly between February and November 1967, and continued on into 1968. This coal was delivered by a truck fleet apparently operating between the Wankie colliery (which is controlled by Anglo-American Corp., a major Zambian copperbelt producer) and the Zambian border railhead at Livingstone. This level of shipments indicates a total 1967 export to Zambia of about 480,000 tons; presuming that these were the only exports, then coal availability to Rhodesian consumers was at least 1.1 million tons greater than in 1965, an important addition to energy availability in view of the United Nations' restriction on petroleum imports.

Petroleum.—The United Nations Security Council resolution on sanctions against Rhodesia included a statement on oil calling for U.N. members to prevent the supply of oil or oil products to Southern Rhodesia. As a result, Rhodesia's 18,000-barrel-per-day Umtali Refinery, which was supplied via a pipeline partially controlled by British interests, has been shut down. Petroleum products, however, continued to reach Rhodesia by highway deliveries from the Republic of South Africa and railway shipments from Mozambique. Both the Republic of South Africa and Portugal have stated their intention to ignore the sanctions. The share of southern Rhodesia's fuel needs represented by oil, about 10,000 barrels per day prior to the embargo, has been met by substituting coal in some industrial operations and by imposing some rationing of gasoline. In addition, Southern Rhodesia has increased storage facilities at its railhead of the line from Mozambique. Oil experts in Africa have stated that regardless of the position on sanctions taken by the Government of the Republic of South Africa, Mozambique is capable of supplying all Rhodesian oil needs with output from the Matola refinery (near Lourenco Marques) which, if necessary, could be supplied with crude from the Portuguese province of Angola.[9]

[9] Petroleum Press Service. V. 34, No. 1, January 1967, p. 25–26.

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The Mineral Industry of Rumania

By Roman V. Sondermayer [1]

Petroleum remained Rumania's most important contribution to world mineral supplies in 1967; among European producers the nation's crude oil output again ranked second only to that of the U.S.S.R. Production of more than 13.2 million tons of crude oil was equivalent to approximately 4.5 percent of the Soviet output and nearly 1 percent of world production. In addition to crude oil, Rumania produced manganese ore, cement, pyrites, and salt, each in quantities roughly equal to 1 percent of the world totals. Their quantities are significant, however, primarily with regard to the domestic economy.

Efforts to develop the country's resources continued and apparently ranked as a primary target of the Government. Extensive exploration was carried out, and the metal smelting and manufacturing base was expanded. In spite of improvements in domestic supply, Rumanian output was inadequate to cover internal demand for metals. Crude oil exploration yielded results barely adequate to compensate in the natural decline in production of existing operating fields. Therefore the supply-demand position of the country with regard to basic minerals did not change significantly in 1967.

The mineral industry contributed roughly 18 percent to the 1967 social product [2] of $19 billion. Approximately 230,000 persons, one-seventh of the total labor force, were employed in the mineral industry. Thus a greater share of the social product was contributed by the mineral industry than is indicated by its share of the total labor force. This has been primarily the result of the relatively efficient and well-developed petroleum industry; other parts of the mineral industry evidently do not have such an advantageous social-product-to-employment ratio.

Rumania's foreign trade in mineral commodities was modest by world standards, except for petroleum. Exports of refined petroleum products totaled over 6 million tons. Of total exports, about two-thirds were sold to the U.S.S.R. and other Communist Nations. Imports, most of which were from the U.S.S.R., consisted mostly of metals and high-ranked coals and coke.

During 1966 and 1967 the most important developments in the mineral industry included expansion of the aluminum plant at Slatina, commission of the lead-zinc smelter at Copsa Mica in Brasov Region, completion of the thick-sheet rolling mill at the Galati Iron and Steel Plant, completion of catalytic cracking facilities at the Brazi refinery, and completion of Rumania's first oil well with a depth exceeding 4,000 meters.

PRODUCTION

Although oil well drilling, crude oil production, and petroleum refining were the most modern operations of the mineral industry, output of crude oil and its products increased only modestly in 1967. In addition to weaknesses resulting from the existing political and economic system, geological conditions were the principal cause of the slow progress of the industry. Most drillings rigs, production equipment, and workover rigs in use were of Rumanian manufacture; Soviet-made turbodrills were used for directional drilling and in shallow, hard formations. Secondary recovery and fracturing techniques were gaining momen-

[1] Foreign mineral specialist, Division of International Activities.

[2] As in other Communist countries of East Europe, Rumania does not report on its gross national product (value of all final goods and services produced) but rather publishes a figure for the social product, which generally excludes all services and defense.

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tum and were, for all practical purposes, part of everyday production practice in 1967.

Production increases in a number of other commodities were attributed to continued efforts to mechanize mines. Through yearend, however, among underground mines (which constitute the bulk of operating properties in Rumania) some still were not well mechanized.

Table 1.—Rumania: Production of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967 [p]
Metals:					
Aluminum:					
Bauxite [e]	10,000	7,000	80,000	200,000	220,000
Metal and alloys	---	---	22,795	46,851	50,000
Iron and steel:					
Iron ore—thousand tons	2,286	1,932	2,479	2,681	2,796
Pig iron—do	1,706	1,924	2,019	2,198	2,200
Steel ingots and castings—do	2,704	3,039	3,426	3,670	3,700
Rolled products except pipe—do	1,918	2,200	2,347	2,585	2,600
Pipe—do	478	552	586	630	NA
Manganese ore	260,000	100,000	126,000	[e] 260,000	260,000
Mercury—76-pound flasks	194	194	191	190	190
Lead (smelter) [e]	12,500	12,700	15,000	40,000	40,000
Silver [e]—thousand troy ounces	643	643	643	750	800
Nonmetals:					
Barite	NA	NA	45,000	[e] 50,000	55,000
Bentonite	NA	NA	90,000	[e] 100,000	110,000
Cement—thousand tons	4,369	4,752	5,405	5,886	6,338
Fertilizer materials:					
Nitrogenous (nitrogen content)	84,850	107,981	166,307	264,236	280,000
Phosphatic (P_2O_5 content)	99,759	111,323	126,465	155,112	160,000
Kaolin	NA	NA	35,000	[e] 40,000	50,000
Lime—thousand tons	[r] 1,206	[r] 1,040	[r] 1,027	[r] 1,047	1,050
Pyrites (gross weight)—do	333	409	[e] 410	[e] 360	360
Salt—do	1,637	1,809	2,016	2,046	2,100
Sulfric acid—do	343	350	360	[r] 619	700
Talc—do	[e] 100	[e] 100	115	[e] 120	130
Mineral fuels:					
Carbon black	33,177	35,394	36,704	38,288	50,000
Coal:					
Bituminous including anthracite—thousand tons	5,655	5,892	6,036	[r] 6,310	6,600
Brown—do	558	5,231	598	638	640
Lignite—do	4,054		5,461	6,503	7,000
Coke—do	1,141	1,145	1,135	1,103	1,200
Natural gas [2]—million cubic feet	376,970	426,073	480,179	497,196	559,525
Petroleum:					
Crude—thousand tons	12,233	12,395	12,571	12,825	13,200
Refinery products:					
Gasoline—do	2,434	2,500	2,458	2,349	2,200
Kerosine—do	1,084	1,100	965	920	860
Gas oil—do	3,110	3,200	3,600	3,746	4,000
Fuel oil—do	4,059	3,831	3,773	3,952	4,200
Lubricants—do	408	448	483	496	500
Asphalt—do	295	321	341	370	400

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.

[1] In addition to listed commodities, Rumania produces antimony, chromite, copper, gold, molybdenum, zinc, asbestos, feldspar, gypsum, and mica, but quantitative data on production are not available.

[2] From 1965 includes associated gas.

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TRADE

Only general information was available on Rumanian foreign trade in mineral commodities as distribution by destination and origin was not reported in Rumanian publications. Foreign trade in minerals continued to be a State monopoly, planned by the Government as a part of overall economic programing. Communist countries were again the principal mineral-trade partners.

However, the nation made efforts to increase trade with the non-Communist world, particularly in acquiring mining equipment and technology. Petroleum refinery products were one of the principal export items of Rumania. The value of petroleum products exported to the industrially developed non-Communist countries was equivalent to about $60 million in 1965, the latest year for which data are available. High-rank coals and metals were the principal mineral commodity import items. Mineral trade with the United States was minimal during 1967.

Table 2.—Rumania: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965		1966	
	Total	To U.S.S.R.	Total	To U.S.S.R.
Metals:				
Lead metal	NA	4,500	NA	---
Iron and steel:				
Steel ingots	NA	78,800	NA	93,100
Primary forms for rerolling and rolled products	342,000	231,500	444,500	211,500
Pipe	235,200	188,200	251,100	207,600
Manganese ore	79,900	---	48,500	---
Zinc, unwrought	NA	2,400	NA	2,400
Nonmetals:				
Barite	NA	8,000	NA	16,400
Cement	1,538,200	---	1,635,700	---
Salt	478,400	---	429,800	---
Mineral fuels:				
Bitumen (including natural)	106,200	66,100	69,700	---
Carbon black	17,300	---	17,700	---
Natural gas---million cubic feet	700	---	700	---
Petroleum refinery products:				
Gasoline	1,444,100	942,000	1,181,100	648,100
Kerosine	280,100	167,400	276,900	46,600
Diesel oil	1,979,100	200,700	1,949,700	116,400
Fuel oil	1,638,600	50,000	1,959,700	36,800
Lubricants	293,800	133,800	274,100	119,900
Paraffin	19,800	12,000	20,700	10,000
Petroleum coke	51,500	---	36,900	---

NA Not available.

[1] Compiled from official trade statistics of Rumania and the U.S.S.R. Data on total exports are from Anuarul Statistic Al Republicii Socialiste Romania 1967 (Statistical Yearbook of R. P. Rumania 1967), Bucharest, 1967; data for the U.S.S.R. are Soviet import statistics published in Vneshnaya Torgovlya SSSR za 1966 god (Foreign Trade of the U.S.S.R. for 1966), Moscow, 1967. The latter have been included owing to obvious omission in the Rumanian source and because the U.S.S.R. is Rumania's foremost trading partner.

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Table 3.—Rumania: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965		1966	
	Total	From U.S.S.R.	Total	From U.S.S.R.
Metals:				
Aluminum:				
Ingots	NA	5,600	NA	600
Semimanufactures [2]	NA	595	NA	1,685
Copper:				
Unwrought	NA	5,900	NA	4,200
Semimanufactures [2]	NA	2,187	NA	1,287
Iron and steel:				
Iron ore thousand tons	2,623	1,714	2,854	2,428
Pig iron do	NA	358	NA	342
Ferroalloys do	53	45	51	57
Rolled products do	1,117	797	1,187	829
Pipe do	81	16	82	20
Nonmetals:				
Asbestos	NA	4,500	NA	6,700
Cryolite	NA	200	NA	200
Fertilizers:				
Apatite concentrate (P_2O_5 content)	174,300	254,200	207,300	---
Potassic fertilizers (K_2O content)	13,300	---	21,900	---
Nitrogenous fertilizers (N content)	NA	---	100	---
Refractories, all kinds	63,000	23,600	62,400	24,800
Sulfur	NA	4,400	NA	2,700
Mineral fuels:				
Coal:				
Bituminous	706,300	251,000	722,800	358,000
Coke, metallurgical	926,800	541,000	1,102,400	592,000
Petroleum refinery products:				
Lubricants	NA	600	NA	400

NA Not available.

[1] Compiled from official trade statistics of Rumania and the U.S.S.R. Data on total imports are from Anuarul Statistic Al Republicii Socialiste Romania 1967 (Statistical Yearbook of R. P. Rumania 1967), Bucharest, 1967; data for the U.S.S.R. are Soviet export statistics published in Vneshnaya Torgovlya SSSR za god 1966 (Foreign Trade of the U.S.S.R. for 1966), Moscow, 1967. The latter have been included owing to obvious omission in the Rumanian source and because the U.S.S.R. is Rumania's foremost trading partner.

[2] Alloys included.

COMMODITY REVIEW

METALS

Aluminum.—Because of new additions the capacity of Rumania's first aluminum plant at Slatina was increased to 50,000 tons in 1966, and production in 1967 indicated that most of the initial operational difficulties had been overcome. Reports indicate the possibility of further plant expansion which would bring the annual output to 75,000 tons of aluminum by 1970.

Bauxite and alumina output were increased to provide for the increased metal output. However, difficulties were encountered and the Rumanians have spent large sums to develop both adequate resources of low-grade bauxite and methods to beneficiate this material.

The principal sources of Rumania's bauxite in 1967 were the deposits near Dobresti, at Chistag, and near the Padurea Craiului Hills. The alumina plant at Oradea was being expanded during 1967. Reports indicated that the new annual capacity of the plant, amounting to 200,000 tons of alumina, would be reached in 1968. However, in spite of efforts to increase production of bauxite, Rumania found it necessary both to suspend exports and to import bauxite in significant quantities in 1967.

Copper.—The Baia Mare chemical and metallurgical complex was not completed during 1967, although some of the smelting facilities and the sulfuric acid plant were commissioned for testing early in the year. Capacities of the new facilities were not announced.

Modernization of the Balan mine complex in the Mures Region was underway during 1967. Plans for a fourth beneficiation line were drawn up, and development

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of a new mine was started. Reportedly the new facilities will reach the capacity of 1 million tons of cupriferous ore by 1970.

Intensive prospecting for copper continued in the general area of Moldava Nuova and Lesu Ursului, but results were not made public. The modernization of port installations at Moldava Nuova which will facilitate the flow of materials to and from the new cupriferous region in southern Rumania continued during 1967.

Iron and Steel.—Although lacking in domestic iron ore resources, Rumania continued to develop its iron and steel industry during the year. This sector of the economy remained the key new component of development planning in the country. During 1967, exploration for iron ore, import arrangements, and construction of the Galati steel complex were the focal points of Rumania's iron and steel industry. Development of the Gehlar East iron mines was completed in June, and by yearend production of the new mine totaled 80,000 tons. In addition, the largest mine tunnel in Rumania, 6,100 meters long, connecting the Gehlar mines with processing facilities in Teliuc was completed. The new connection reduces the ore-haulage distance by one-third, thereby reducing cost for ore mined in the Poiana Rusca basin. To reduce the cost of transportation of imported ore Rumanian authorities have contracted for construction of the country's own fleet of bulk ore carriers. In recent years seven ore vessels for Rumanian registry, were completed in Japan.

Construction continued at the Galati steel complex. Built on an area of approximately 620 hectares, the complex should have an annual capacity of 2 million tons of steel in 1970. Rumanian nationals are building the agglomeration plant in the complex with a capacity of 1,000 tons of ore per hour, and a blast furnace section in which each furnace will have a capacity of 1,700 meters. West German interests are building and supplying equipment for an oxygen steel plant to be equipped with 130- to 150-ton converters. Soviet industry is building a 1,150-millimeter slabbing mill that is equipped with a universal rolling-mill stand and adequate soaking pits. A British-French consortium is providing a heavy plate-rolling mill that will annually produce about 1 million tons of plates of 4- to 40-millimeter thickness. At yearend 1967 the heavy plate-rolling mill was in operation after having undergone an unusually large number of difficulties in the initial production period. Power supply was the principal cause of the difficulties. Construction of the nearby thermal power-plant was delayed causing a shortage of power to persist in 1968.

The Hunedoara Iron and Steel Plant, the largest operating iron and steel plant in the country, was undergoing modernization during 1967. Oxygen was introduced in existing steel furnaces and output has reportedly increased by 10 to 20 percent. However it is not clear if the use of oxygen is widely practiced at Hunedoara or whether it is simply a successful experiment.

Lead and Zinc.—The Copsa Mica Chemical and Lead and Zinc Metallurgical Complex in the Brasova Region, Transylvania, started regular production at the beginning of 1967. The plant, which employs the Imperial Smelting Corporation process, reportedly has a rated annual capacity of about 50,000 tons of metals (lead plus zinc) and 100,000 tons of sulfuric acid.

NONMETALS

Barite.—Rumanian geologists have reported the discovery of new barite deposits near Ostra at the Baraul Massif in the eastern Carpathians, and at Somova, Constanta Region. Plans have been made to develop a mine, an ore-dressing plant, and packing facilities at Ostra, which will be in full operation by 1970. Capacity of the new development was not announced, but total Rumanian barite production is expected to be increased from 45,000 tons in 1965 to 105,000 tons in 1970.

Chalk.—After trial production in 1966, the Murfatlar chalk factory in Dobrogea started normal production at the beginning of 1967. Utilizing nearby limestone resources the plant will produce 100,000 tons of ground chalk annually.

Cement.—Construction of a 2-million-ton-per-year cement plant at Biresti near Tirgu Jiu was completed in mid 1967.

Diatomite.—The Harghita Mountain mines were the principal supplier of raw diatomite during the year. The new modern equipment that was installed in the plant in Odhorei increased capacity from 2 to 20 tons per hour.

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Fertilizers.—After trial production in 1966 the nitrogen fertilizer combine in Tirgu Mures started normal production in 1967. Annual output of the new plant reportedly will include 90,000 tons of ammonia, 120,000 tons of nitric acid (100 percent), 150,000 tons of ammonium nitrate (34.5 percent), and 40,000 tons of aqueous ammonia (25 percent).

In addition, a second urea production line and a new sulfuric acid plant are in operation at Turnu Magurel Chemical Fertilizer Combine. The new facilities reportedly will produce 100,000 tons of urea. Plant output of sulfuric acid was not reported.

Limestone.—A deposit of very good quality limestone was discovered at Mahmudia near Tulcea in Dobrogea Region. The location of the deposit is favorable for shipping the limestone to the Galati steel complex on the Danube.

Salt.—A new salt mine, and a modern salt-processing plant were under development at Tirgu Ocna Salina. Annual mine capacity will be 350,000 tons of salt, and the chemical plant at Borezesti will be the main user. Expansion of the salt deposits at Ocnele Mari was underway. Fourteen new salt wells will be drilled by 1970. The saline solution will be supplied by pipeline to the sodium plant in Govora and to the new chemical combine in Rimnicula Vilcea.

MINERAL FUELS

Coal.—The output of low-rank coals was again increased in 1967, and its position in the energy supply pattern became more important. Deficiency in high-rank coals persisted, and substantial imports were required to meet the demand. During 1967, in addition to opening new mines in the Rovinari basin, Rumania's authorities undertook modernization of mines in the Jiu Valley.

The Cicani lignite mine in the Rovinari basin, 85 kilometers north from Craiova, was commissioned in June 1967. According to reports the annual capacity is 1.15 million tons. The mine is the first of several lignite mines that will be developed in Oltenia Region. During 1967 the first mining shaft was completed at a new mine at Livazeni in the Jiu Valley. At the same time two additional shafts were being constructed and work on a fourth was started. When all four shafts are completed, capacity of the mine will be 1.2 million tons of lignite per year.

An exploration project at Suplacul de Bacua in Crisana Region lead to discovery of a new field having reserves estimated at 21 million tons of lignite. Plans call for development of a new mine with start of production scheduled for early 1970.

Recently disclosed plans for energy production indicated that the additional lignite will be used in the production of thermal electric power.

Petroleum and Natural Gas.—Deep drilling, secondary recovery, and completion of new refinery sections were the highlights of the Rumanian petroleum industry in 1967. Domestic crude oil output was adequate to cover the demand of domestic refineries. Having only modest consumption, Rumania was a significant exporter of petroleum refinery products. Realizing future difficulties in maintaining and increasing the present level of production, Rumania made arrangements with Iran and Saudi Arabia for imports of crude oil. Apparently the shallow structures have been fully explored, and to keep up the present output of crude oil and gas the Rumanians found it necessary to start exploring deep structures. Understandably, deep drilling yielded results far more slowly than shallow operations. Accordingly, exploration started to lag behind planned targets, and it became necessary to make arrangements for import of crude oil.

During 1967, in addition to the exploration of deep structures by seismic and gravimetric methods, several deep-drilling operations were underway in different parts of the country. The most promising results were obtained in the well-known Moreni field in the old Prahova Valley. At a depth of over 4,000 meters gas was found. The discovery is important because it indicates the possible presence of additional oil reserves in a region that has complete production facilities available. In the Gorj Rayon a well reached the depth of 6,000 meters in the Carbunesti field. At yearend 1967 another rig started to drill the second deep well in the area. In connection with deep drilling, the Rumanian petroleum research institution worked on drilling fluids, cements, and production tools for deep wells having high temperatures.

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Although some new oilfields were discovered in the Bargan and Burnas Plains in the Bucaresti Region, part of the higher output was attained through larger application of fracturing and secondary recovery.

Underground combustion has been used as a stimulus to production at a project involving four wells in the Gura Ocintei oilfield. The field produces small quantities of high-viscosity oil, and production has reportedly increased by 25 percent since the use of thermal secondary recovery methods were initiated.

According to reports, construction has begun on a new petroleum refinery at Suplacu de Barcau in Crisana Region. The refinery will have a capacity of 300,000 tons of crude oil per year. The Institute for Design of Petroleum Installations in Ploesti designed the refinery, and about half of the equipment will come from that available at other Rumanian refineries. Construction of this refinery confirms rumors of the discovery of an oilfield in the area of Marghita in northwestern Rumania.

At the refinery at Brazi the construction of a new catalytic cracking complex has been completed, and test production was started on September 8, 1967. The new complex is designed for a yearly processing capacity of 1.1 million tons. The cost of the project was $22.5 million, and a company from the United States provided engineering services and equipment. A new paraffin plant with an annual capacity of 5,500 tons was commissioned at the Taleajen oil refinery at Ploesti.

At the Pitesti refinery a new atmospheric distillation unit and an electric desalination plant were under construction at year-end. Capacities of the new additions were not disclosed.

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The Mineral Industry of Saudi Arabia

By James A. West [1]

In 1965 and 1966 Saudi Arabian crude oil output expanded at an annual rate of 18 percent, enabling Saudi Arabia to replace Kuwait as the leading oil producer in the Near East in 1966. Despite the disruptions in normal oil operations caused by the Arab-Israeli war, Saudi Arabia maintained this leading position throughout 1967, and accounted for 26 percent of Near East, and 7 percent of total world crude oil production.

Petroleum production and refining continued as the principal industry and dominated the national economy. Petroleum produced during 1967 had an estimated value of nearly $1,600 million. Government revenue from petroleum companies operating in Saudi Arabia and in the Kuwait-Saudi Arabia Neutral Zone was an estimated $825 million, providing about 90 percent of total revenues and foreign exchange earnings. Aside from petroleum, the country's only mineral products were cement, gypsum, lime, salt, and minor building materials. The mineral industry employed about 15,000 persons, mostly in petroleum operations.

A major part of the Government's industrial diversification policy was encouragement and support of the development of mineral resources, to lessen the country's dependence on the petroleum industry. The Ministry of Petroleum and Mineral Resources, through its corporate subsidiary, General Petroleum and Mineral Organization (Petromin), proceeded with various mineral exploration and industrial development projects. Mineral surveys, mapping, and evaluation projects were expanded. A newly formed company, Arabian Geophysical and Surveying Co. (owned 51 percent by Petromin and 49 percent by the French firm, Compagnie Générale de Géophysique), was awarded contracts to extend geomagnetic surveys of the Arabian shield and to establish a geodetic net covering most of the country.

Substantial progress was reported on several Petromin industrial projects. Construction of a steel rolling mill at Jidda was completed, and the plant went on stream in late 1967. The Japanese firm Chiyoda was awarded a $6.6 million contract for construction of a 12,000-barrel-per-day oil refinery at Jidda. At yearend, the nearly completed refinery was being tested prior to initial operation. On December 18, 1966, Petromin awarded a contract to Chemical Construction Corp. of New York for construction of a $40 million fertilizer plant near Dammam. Of the total contract value, about $30.5 million is for plant construction and the remainder will be invested in auxiliary facilities. The plant will be operated by Saudi Arabian Fertilizer Co. (owned 51 percent by Petromin and 49 percent by private Saudi Arab investors) in a joint venture with Occidental Petroleum Corp. Completion of the plant is scheduled for early 1969.

Also, Petromin signed an agreement with Allied Chemical Corp. and Occidental Petroleum Corp. for establishment of a jointly owned sulfur plant at Abqaiq. The plant will recover 600 to 700 tons per day of sulfur from natural gas supplied by the Arabian American Oil Co. (Aramco). After desulfurization, the gas will be returned to Aramco for reservoir injection.

On September 30, 1966, the Government of Saudi Arabia and Aramco signed an agreement settling their dispute over the basis for calculating taxable profits on Aramco sales to nonaffiliated third parties. Effective January 1, 1966, Aramco agreed to file tax returns, based on sales of crude

[1] Chief area specialist, Near East-Africa, Division of International Activities.

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oil and products at posted rather than realized prices, retroactive to 1961. The Government was expected to receive an estimated $67 million in retroactive payments.

In late 1967, the Government granted oil exploration and exploitation rights on specific concessions in the eastern Rub-al-Khali and Red Sea coastal areas to Petromin. In turn, Petromin concluded an agreement with Ente Nazionale Idrocarburi of Italy (ENI) to conduct exploration and share rights in the Rub-al-Khali concession. Petromin also concluded a similar agreement with a consortium (comprised of Sinclair Oil Co., Natomas, and the Government of Pakistan) for the Red Sea area concession.

PRODUCTION

Despite disruptions in oil shipments caused by the Arab-Israeli war and the brief embargo on shipments to certain western countries afterward, the established trend of annual increases in crude oil output to record new highs continued through 1967. Crude oil production in 1967 exceeded that of 1966 by 8.6 percent. On November 22, 1967, cumulative oil production from Saudi Arabian oilfields reached 9 billion barrels.

Table 1.—Saudi Arabia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Nonmetals:					
Cement	186,000	239,817	264,000	250,242	e 250,000
Gypsum	36,000	NA	22,599	e 25,000	e 25,000
Lime	6,200	NA	30,000	e 20,000	e 20,000
Marble	48,400	NA	NA	e 20,000	e 20,000
Salt	9,700	NA	NA	e 8,000	e 8,000
Mineral fuels:					
Crude petroleum thousand 42-gallon barrels	594,592	628,095	739,078	873,349	948,110
Refinery products:					
Aviation gasoline do	335	373	244	327	125
Motor gasoline do	10,440	13,537	17,052	17,650	20,404
Jet fuel do	4,506	6,159	8,345	10,276	9,438
Kerosine do	3,805	3,197	2,190	1,921	2,885
Distillate fuel oil do	15,174	13,689	12,737	16,029	16,221
Residual fuel oil do	53,388	56,376	63,811	60,334	64,655
Liquefied petroleum gas do	2,116	4,031	5,062	5,679	6,683
Miscellaneous do	4,866	5,814	281	654	842
Refinery fuel and loss do	3,872	4,525	5,839	5,260	5,577
Total do	98,502	107,701	115,561	118,130	126,830

e Estimate. NA Not available.

TRADE

Crude oil and petroleum products continued to account for virtually all of Saudi Arabia's mineral exports. In 1966 and 1967, petroleum exports were valued at an estimated $1,573 and $1,600 million, respectively.

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Table 2.—Saudi Arabia: Exports and reexports of petroleum and petroleum products [1]

(Thousand 42-gallon barrels)

Commodity	1965	1966	1967
Crude petroleum	623,515	760,127	819,823
Refinery products:			
Aviation gasoline	83	75	------
Motor gasoline	15,349	14,695	16,441
Jet fuel	8,174	10,389	9,162
Kerosine	1,053	605	1,389
Distillate fuel oil	10,428	12,691	12,070
Residual fuel oil	44,177	38,843	33,046
Liquefied petroleum gas	4,650	5,605	6,406
Total	83,914	82,903	78,514
Bunkers, all flags:			
Distillate fuel oil	458	465	1,721
Residual fuel oil	19,576	21,680	31,440

[1] Data on geographic distribution on individual items are not available. The continental distribution of total crude oil and refinery products produced by Aramco (excluding bunkers) in 1967 was as follows, in percent: Europe 48.7; Asia and Australia 37.9; North America 4.4; South America 3.9; and Africa 5.1.

The Kingdom remained dependent on imports for almost all metals and most nonmetallic minerals required by its rapidly expanding economy. The relative importance of mineral commodity trade to total trade during 1965 and 1966, based on the most recent estimates, is shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of trade (percent)
	Mineral commodities	Total trade	
Exports (including reexports):			
1965	1,335	1,340	99
1966	1,573	1,587	99
Imports:			
1965	30	502	6
1966	35	594	6
Trade balance:			
1965	1,305	838	XX
1966	1,538	993	XX

XX Not applicable.

COMMODITY REVIEW

METALS

Iron and Steel.—Saudi Arabia's first steel rolling mill was completed in late 1967, and the mill was in test operation at yearend. The plant will produce up to 45,000 tons per year of bars, flats, and angles using imported ingot. It may ultimately prove feasible to utilize the large iron ore deposits of the Red Sea coastal area to produce pig iron for the mill.

NONMETALS

Construction Materials.—Saudi Arabia continued to rely on imports for most of the cement and other building materials required by its booming construction industry. The domestic cement industry took steps to expand capacity in response to heavy demand throughout the nation. On October 12, 1966, the Yamamah Cement Co. inaugurated its new plant near Riyadh. Construction of facilities to raise capacity of the Saudi Cement Co. Hofuf plant from 300 to 600 tons per day were completed in 1967. Plans have already been announced to further increase capacity to 1,200 tons per day. Lime, gypsum, marble and other building materials were produced and consumed locally, but quantitative production data are not regularly reported.

Salt.—Large deposits of rock salt are known to occur in the Red Sea coastal area near Jizan and on the Arabian Gulf coast near Dhahran. The National Bulk

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Carriers Co. has applied for a permit to exploit salt deposits in the Jizan area, where this U.S. firm has held an exploration permit. The company was expected to enter into a joint venture with Petromin and establish a public stock company to develop the deposits. In several parts of the Kingdom, village industries extracted considerable quantities of salt, largely by solar evaporation or primitive means.

MINERAL FUELS

Petroleum.—Aramco remained the sole oil producer in Saudi Arabia proper, and rapid expansion characterized all aspects of the company's operations in 1966 and 1967. In addition to increased crude oil output, Aramco pursued an accelerated program to further expand oil producing, handling, and lifting capacity.

A high level of oil exploration activity was maintained throughout 1966 and 1967. No new oilfields were discovered in 1966 when five dry holes were drilled; however, Aramco discovered three new oilfields in 1967. Commercial oil deposits were reportedly found at Marjan, Jana, and Karan in the offshore area, and natural gas was found in two wildcat wells drilled 80 kilometers apart in the Kidan area.

As of January 1, 1968, Aramco reported [2] that estimated proved crude oil reserves were 77,002 million barrels. This is equivalent to about one-fifth of the world's total proved crude oil reserve.

The oil-producing capacity of Aramco fields was increased by more than 700,000 barrels per day as new oil-handling, pipeline, and related facilities were completed. Most expansion was in the giant Ghawar and Safaniya fields, but new offshore fields at Abu Safah and Manifa and the northern onshore extension of the Qatif field were placed in production in 1966. In February 1967, the onshore portion of the Berri field (discovered in 1964) was placed in production at an initial rate of 30,000 barrels per day.

In 1967, 47 wells were drilled including 31 oil-producing, three water-injection, eight exploration, and five delineation wells. All five delineation wells and two exploration wells were abandoned. A total of 62 wells was drilled in 1966. Well completions included 41 producing wells, 14 water-injection wells, two observation wells, and five dry holes.

The oil-lifting capacity of the Ras Tanura terminal was increased by 1 million barrels per day as two of the three planned "sea island" oil-loading facilities went into operation during 1966 and 1967. The sea islands, consisting of two parallel berths on each side of a central loading platform, were constructed about 2 miles offshore in 90 feet of water. Thus, the terminal can easily handle the new supertankers of 185,000 deadweight tons or more. Construction proceeded on the third sea island, with completion scheduled for early 1968.

The record 1967 crude oil output of 2,597,563 barrels daily was from 12 fields having about 375 producing wells. The principal producing fields and their percentage of total output were Ghawar, 48; Abqaiq, 20; Safaniya, 17; Khursaniya, 3.5; Qatif, 2.5; Abu Hadriya, 2.5; and Manifa, 2. The Abu Safah, Fadhili, Dammam, Berri, and Khurais fields accounted for the remaining 4.5 percent.

The French State-owned oil exploration company, Société Auxiliare de la Régie Autonome des Pétroles (AUXERAP), completed detailed seismic surveys in the southernmost of its three oil concession parcels in the Red Sea offshore and coastal area. In 1967, AUXERAP drilled its first exploration well at Mansiyah, an onshore location near Jizan. The well was abandoned as a dry hole after reaching a depth of about 13,000 feet.

Natural Gas.—Natural gas produced in association with oil recovery averaged about 1.5 billion cubic feet daily during 1966 and 1967. Nearly one-fourth of this gas was utilized for reservoir injection in the Abqaiq and Ain Dar fields. About 50 million cubic feet per day was utilized by local industry for power generation or in camp and field use. The remainder was flared or used to drive combustion-gas turbines.

[2] Arabian-American Oil Co. A Review of Operations. 1967 p. 27.

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The Mineral Industry of Senegal

By Eugene R. Slatick [1]

Senegal's mineral industry in 1967 continued to be dominated by phosphate rock mining. In 1966, the year of the most recent economic data, the phosphate mining industry provided about 30 percent of the total tonnage exported from Dakar, about 35 percent of the country's railroad freight tonnage, and consumed about 30 percent of the total electricity. In addition, it earned $12 to $13 million [2] in convertible foreign exchange, mostly outside the franc zone. Senegal's phosphate mining industry is export-oriented and reportedly faces strong competition on the world market.

The Government of Senegal and the United Nations concluded an agreement in March 1967 to extend for 2 years the mineral resources study begun in eastern Senegal in March 1963. The extension reportedly was attributed to encouraging discoveries of chromite, diamond, and gold, and calls for total expenditures of $876,000, of which $438,000 will be provided by the United Nations Development Program. The initial agreement was for $1,640,000, of which the United Nations Development Program provided $934,800. The French Bureau de Recherches Géologiques et Minières also prospected for minerals in eastern Senegal.

Offshore drilling for oil continued in 1967, but there were no discoveries.

In September a decree (No. 67-1006) was enacted to establish an ad valorem tax on all products mined in Senegal except for crude oil and natural gas.

PRODUCTION

Senegal's mineral output in 1967, as in past years, was comprised mainly of fertilizer materials, chiefly calcium phosphate. The average phosphatic content was as follows: Calcium phosphate, 38 percent P_2O_5; aluminum phosphate, 30 percent P_2O_5; dehydrated aluminum phosphate and other fertilizer materials, 34 percent P_2O_5.

[1] Foreign mineral specialist (petroleum), Division of International Activities.

[2] Where necessary, values have been converted from the African Financial Community franc (CFAF) to U.S. dollars at the rate of CFAF 245=US$1.

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Table 1.—Senegal: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Titanium concentrate:					
Ilmenite	12,189	1,320	-------	-------	---------
Rutile	708	54	-------	-------	---------
Zirconium concentrate	3,069	554	-------	NA	---------
Nonmetals:					
Attapulgite	-------	-------	r 1,775	r 2,616	1,500
Cement—thousand tons	190	205	181	194	175
Fertilizer materials:					
Phosphate rock:					
Aluminum phosphate	125,814	120,939	134,940	144,781	151,282
Calcium phosphate	470,080	677,081	867,239	990,000	1,115,000
Processed:[1]					
Aluminum phosphates dehydrated	17,710	32,254	18,090	51,908	51,762
Other [2]	e 10,900	10,018	7,694	18,904	9,631
Salt [3]—thousand tons	60	56	51	61	60
Mineral fuels:					
Petroleum:					
Refinery products:					
Gasoline—thousand 42-gallon barrels	30	624	r 787	592	1,226
Kerosine and jet fuel—do	5	206	r 457	484	133
Distillate fuel oil—do	26	514	r 864	727	822
Residual fuel oil—do	22	704	r 1,051	1,781	1,359
Liquefied petroleum gas—do	-------	[4] 201	27	31	57
Total—do	83	2,249	r 3,186	3,615	3,597

e Estimate. r Revised. NA Not available.
[1] Derived from crude aluminum phosphate output.
[2] Includes products marketed under trade names of Baylifos and Phosphal.
[3] Includes production of Mauritania, estimated at 500 to 800 tons per year.
[4] Includes 181,000 barrels of partly refined products.

TRADE

Senegal's trade balance, particularly for mineral commodities, improved in 1966 as compared with 1965. This was largely due to a rise in the value of total exports of phosphate rock, the country's principal mineral export, from $10.8 million in 1965 to $14 million in 1966. Based on value, the principal mineral imports in 1966 were mineral fuels, $9.9 million, of which petroleum products accounted for $7.3 million and iron and steel semimanufactures, $3.6 million. The values of mineral trade and total trade for recent years compared as follows:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	11.2	128.4	8.7
1966	15.8	148.9	10.6
Imports:			
1965	19.2	164.3	11.7
1966	16.8	161.0	10.4
Trade balance:			
1965	−8.0	−35.9	XX
1966	−1.0	−12.1	XX

XX Not applicable.
[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.

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Table 2.—Senegal: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Copper:			
Metal	65	1,722	Japan 1,496; France 226.
Scrap	156	668	NA.
Iron and steel:			
Scrap	3,013	6,707	Spain 4,790; Italy 1,902.
Unwrought and semimanufactures.	4	126	Mauritania 87; Guinea 13.
Lead	29	110	Belgium-Luxembourg 45; Italy 33; France 32.
Zinc	5	15	France 13.
Nonferrous minerals, ore and concentrate, n.e.s.	94	461	France 216; Belgium-Luxembourg 165.
Nonmetals:			
Cement and lime	51	3,875	Mauritania 2,229; Spain 1,001.
Fertilizer materials:			
Phosphate rock:			
Aluminum phosphate	108,350	81,100	France 81,080.
Calcium phosphate	818,620	1,074,000	West Germany 300,631; Republic of South Africa 196,889; United Kingdom 193,529; Japan 192,749.
Manufactured [1]	r 33,336	47,878	France 31,635.
Fuller's earth	700	1,564	NA.
Salt	6,144	7,965	NA.
Other, n.e.s	6,162	7,971	Gabon 2,000; Congo (Brazzaville) 1,711; Sierra Leone 1,304; Togo 1,006.
Mineral fuels: Petroleum refinery products, unspecified.	58	12,370	Ship's stores 12,015.

r Revised. NA Not available.
[1] Includes dehydrated aluminum phosphate and products marketed under trade names of Baylifos and Phosphal.

Principal sources: Statistical Office of the European Communities, Overseas Associates. Republic of Senegal, Monthly Statistical and Economic Bulletin, Dakar, Senegal No. 4–5, 1967.

Table 3.—Senegal: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum [1]	287	249	France 226.
Copper [1]	110	103	France 100.
Iron and steel:			
Scrap	21	71	Guinea 58.
Pig iron and ferroalloys	22	3	West Germany 2; France 1.
Semimanufactures:			
Bars, rods, shapes	15,988	11,034	France 8,051; Belgium-Luxembourg 2,382.
Plate and sheet	6,840	5,379	France 2,672; Belgium-Luxembourg 2,411.
Tubes, pipes, and fittings	7,273	2,920	France 2,438; Belgium-Luxembourg 249.
Other	1,799	1,647	France 1,533.
Lead [1]	111	66	All from France.
Tin [1]—long tons	8	16	France 11.
Zinc	49	29	France 23.
Nonferrous metals, n.e.s	1	2	All from France.
Nonmetals:			
Abrasive materials	53	44	France 21; Algeria 19.
Cement and lime	7,476	2,760	France 2,350; Morocco 350.
Clay construction materials	2,715	2,115	France 1,107; West Germany 813.
Fertilizers, crude and manufactured	21,772	30,188	France 15,279; Belgium-Luxembourg 6,543; West Germany 6,250.
Pyrite	---	6	All from France.
Stone, construction: Sand and gravel.	5,085	4,281	Morocco 3,503; Italy 456; France 272.
Nonmetals, n.e.s	1,501	1,923	France 1,271; Canada 202.
Mineral fuels:			
Coal, coke, and briquets	899	278	France 253; Poland 25.
Petroleum:			
Crude and partly refined	e 390,000	455,160	Algeria 278,591; Gabon 176,569.
Refinery products unspecified	156,410	203,054	NA.

e Estimate. NA Not available.
[1] Unwrought and semimanufactures, including alloys.

Source: Statistical Office of the European Communities, Overseas Associates.

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COMMODITY REVIEW

NONMETALS

Fertilizer Materials.—*Phosphate Rock*—Although production of calcium phosphate rose in 1967, approximately one-fourth of the total had to be stockpiled because a saturation of phosphate on the world market caused prices to drop.

Early in the year Compagnie Sénégalaise des Phosphates de Taiba announced plans to increase its annual phosphate production capacity from 1.2 to 1.8 million tons. Later, however, the company decided to postpone the plans because of the depressed world phosphate market. The plans, aimed at reducing production costs per ton of phosphate, call for an investment of up to $26 million primarily to purchase 30 to 40 trucks of 50-ton capacity to haul crude phosphate to the processing plant, about 2 kilometers from the mine site. Presently, phosphate is sent as a slurry through a pipeline.

The reserves of crude phosphate rock at Taïba in 1967 were estimated at 26 to 40 million metric tons. However, recently discovered extensions of the deposit reportedly can raise the total reserves to more than 100 million metric tons.

Aluminum phosphate continued to be produced at the Thiès deposit only during part (November to April) of the dry season because of the limited demand for the commodity. Société Sénégalaise des Phosphates de Thiès, the mine operator, continued prospecting in a 2,000-square-kilometer area east of Tivaouane; no results were reported.

Manufactured Fertilizers.—A fertilizer plant was being constructed at M'Bao by Société Industrielle des Engrais du Sénégal, a French consortium comprised largely of Société des Potasses d'Alsace. Financing is from the European Investment Bank, the International Finance Corporation, and French sources. The plant, which will cost as estimated $12.4 million and employ 150 to 200 persons, is expected to be operating in 1968 with a capacity of 100,000 to 120,000 tons per year. It will produce a variety of complex fertilizers and superphosphates. Phosphate raw materials will be obtained from domestic sources, but such fertilizer elements as sulfur, ammonium, and potassium chloride will be imported. The plant's output is expected to satisfy most of the country's fertilizer needs.

MINERAL FUELS

Petroleum.—In February 1967 Compagnie Pétroles Total (Afrique Ouest), (COPETAO) abandoned the offshore exploratory well at 3,788 meters after finding only shows of hydrocarbons at 2,144 meters. The well was drilled in 16 meters of water about 30 kilometers off the mouth of the Casamance River. The offshore drilling rig, "Ile de France," was then moved to a new site in 44 meters of water about 70 kilometers from the mouth of the river. The results of the drilling were not available at yearend. In November, COPETAO was granted a 2,800-square-kilometer offshore concession to the west of its existing concession area.[3]

In December, Esso Exploration Senegal, Inc., began offshore drilling about 2 kilometers north of Dakar. Using the drilling ship "Glomar Grand Isle," the company planned to drill to about 4,000 meters and test a structure discovered by geophysical surveys.

Production of gasoline at the country's only refinery at M'Bao increased significantly in 1967 at the expense of kerosine and residual fuel oil output. Apparently this shift in product mix was made possible by the greater share of Gabon crude in total imports.

[3] Industries et Travaux D'Outremer. No. 170, January 1968, p. 58.

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The Mineral Industry of Sierra Leone

By Walter C. Woodmansee [1]

As in previous years, the mineral industry in 1967 played an important role in the economy of Sierra Leone. Mining was essentially limited to four commodities—bauxite, iron ore, rutile, and diamond—but these commodities accounted for more than 80 percent of total export value of all commodities and contributed an estimated $65.6 million to the Gross Domestic Product (GDP). The diamond industry alone accounted for about 15 percent of the GDP and, directly or indirectly, for about 20 percent of total government revenues.[2] Estimated 1967 output values were as follows: Bauxite $1.5 million, diamond $50.1 million, iron ore $11.9 million, and rutile $2.1 million.[3]

Sierra Leone Development Company Ltd. (DELCO), the country's sole iron-ore producer, also managed a mineral prospecting venture on behalf of an international consortium comprising DELCO, Uniholdings Ltd., Pickands Mather & Co., Cerro Corp., and Pocantico Oil and Gas Corp. The group was granted exclusive mineral rights in equal shares to a 2,280-square-kilometer tract in the Koinaduga and Tonkolili districts, Northern Province, for a 4-year period, starting in 1966.

PRODUCTION AND TRADE

Bauxite output showed a substantial increase, but iron ore and diamond output was reduced slightly. Rutile production at the large new Sherbro Minerals Ltd. operation began early in the year.

Diamond again was by far the most important single export commodity, although data are lacking for 1967 and are only fragmentary for 1966. Prelimary 1966 data indicate diamond exports valued at $43.8 million ($51.7 million in 1965). Other major mineral exports were iron concentrate ($15.3 million in 1965) and bauxite

[1] Physical scientist, Division of International Activities.

[2] Complete data on GDP and mineral commodity values are not available for 1967.

[3] Where necessary, values have been converted from Leones (Le) to U.S. dollars at the rate of Le 1=US$1.40. On Nov. 22, 1967, the Leone was devaluated to the rate of Le 1=$1.20.

Table 1.—Sierra Leone: Production of mineral commodities

Commodity		1963	1964	1965	1966	1967
Metals:						
Bauxite	thousand metric tons	20	153	207	272	342
Chromite	metric tons	2,782	--	--	--	--
Gold	troy ounces	44	49	NA	--	--
Iron ore	thousand metric tons	1,912	1,993	2,144	2,304	2,098
Rutile	metric tons	--	--	--	--	25,141
Nonmetals: Diamond:						
Gem	thousand carats	555	• r 585	658	629	• 560
Industrial	do	833	• r 878	804	833	• 840
Total	do	1,388	r 1,463	1,462	1,462	• 1,400

• Estimate. r Revised. NA Not available.

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($1.1 million in 1966, $0.8 million in 1965).

Principal mineral imports in 1965, the most recent year for which complete data are available, were petroleum refinery products, $9.4 million, and iron and steel semimanufactures, $3.2 million. The importance of mineral exports in the Sierra Leone economy is illustrated by the relationship of mineral trade to total trade during 1964-65, as follows:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports and reexports:			
1964	• 81.0	95.1	• 85.2
1965	• 75.8	88.5	• 85.6
Imports:			
1964	15.2	99.4	15.3
1965	14.9	107.8	13.8
Trade balance:			
1964	• +55.8	−4.3	XX
1965	• +60.9	−19.3	XX

• Estimate. XX Not applicable.
[1] Values given are for only those commodities listed in tables 2 and 3 of this chapter.

Table 2.—Sierra Leone: Exports of mineral commodities

Commodity		1964	1965	Principal destinations, 1965
Metals:				
Bauxite	thousand metric tons	129	176	West Germany 78; Netherlands 53.
Gold	troy ounces	49	NA	
Iron ore:				
Concentrate	thousand metric tons	1,856	2,088	Netherlands 672; West Germany 632.
Fines	do	156	246	Netherlands 105; United Kingdom 77.
Total	do	2,012	2,334	
Ferromax [1]	metric tons	223	174	West Germany 102; United Kingdom 15.
Nonmetals:				
Diamond, crude, unworked.	thousand carats	1,650	1,525	All to United Kingdom.
Minerals fuels: Petroleum refinery products (reexports):				
Residual fuel oil.	thousand 42-gallon barrels	1,244	1,229	All to bunkers.
Other [2]	do	524	NA	Do.

NA Not available.
[1] Trade name for specularite largely for pigment use.
[2] Includes distillate fuel oil, aviation gasoline, jet fuel, and lubricants.

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Table 3.—Sierra Leone: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal sources, 1965
Metals:[1]			
Aluminum	r 58	67	United Kingdom 26; Belgium 16.
Copper	108	60	United Kingdom 50; Switzerland 6.
Iron and steel:			
Ingots and other primary forms	3	19	United Kingdom 18.
Semimanufactures	17,065	14,218	United Kingdom 8,920; Japan 3,144.
Lead	30	44	United Kingdom 21; Belgium 12.
Platinum troy ounces	3	64	Nigeria 58.
Silver do	1,344	------	
Tin long tons	1	10	Hong Kong 6; Japan 4.
Zinc	641	------	
Ore and scrap, n.e.s.	------	1	Nigeria 1.
Nonferrous metals, n.e.s.	3	2	Poland 1, West Germany 1.
Nonmetals:			
Abrasive materials	5	43	United Kingdom 40.
Cement and lime	62,186	28,072	Poland 13,974; United Kingdom 6,726.
Clay construction materials	504	925	United Kingdom 393; Italy 279.
Fertilizer materials:			
Mineral	744	33	United Kingdom 27.
Manufactured	424	968	West Germany 660; United Kingdom 140.
Salt	9,001	6,991	United Kingdom 6,071.
Sodium hydroxide	268	168	All from United Kingdom.
Stone, dimension	48	109	United Kingdom 66; Belgium 17.
Stone, sand and gravel	250	47,668	Poland 27,002; Italy 20,681.
Tar, mineral	140	95	All from United Kingdom.
Nonmetallic minerals, n.e.s.	248	131	Italy 93; United Kingdom 27.
Mineral fuels:			
Coal, coke and briquets	81	4,135	United Kingdom 4,125.
Gas, natural and manufactured (butane)	65	108	Netherlands 86.
Petroleum:			
Crude and partly refined 42-gallon barrels	34	22	United States 22.
Refinery products:			
Gasoline thousand 42-gallon barrels	206	250	Netherlands West Indies 91; Italy 60.
Kerosine do	127	78	Italy 30; Netherlands West Indies 18.
Jet fuel do	NA	66	Netherlands West Indies 35; Trinidad 14.
Distillate fuel oil do	1,671	1,365	Netherlands 606; Trinidad 225.
Residual fuel oil do	r 111	184	United Kingdom 94; Trinidad 90.
Lubricating oils do	26	16	United Kingdom 8; United States 4.
Total do	2,141	1,959	
Greases, wax, jelly	243	178	United Kingdom 84; West Germany 38.
Asphalt and bitumen	2,994	3,556	United Kingdom 2,822.
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation.	283	490	United Kingdom 489.

r Revised. NA Not available.
[1] Unwrought and semimanufactures, including alloys, unless otherwise specified.

COMMODITY REVIEW

METALS

Aluminum and Bauxite.—Sierra Leone Ore & Development Co., a subsidiary of Suisse Aluminium Industrie AG, substantially increased production and shipments of bauxite from its Mokanji Hills deposit, Moyamba district, in 1967. Further expansion was expected in 1968. Bauxite exports in 1966 were 244,000 tons, valued at $1,085,000. The company considered establishing an aluminum-product fabrication plant at Freetown in 1966 but, insofar as known, no action was taken through 1967.

Iron Ore.—Sierra Leone Development Co. Ltd. (DELCO), in its 35th year of activity at the Marampa mine, shipped 2.1 million tons,[4] of iron-bearing materials compared with 2.2 million tons in 1966. The 1966 exports were largely concentrates (2.1 million tons). Value apparently dropped substantially, due to lower world prices. Average concentrate export prices (f.o.b.), per long ton, were $7.38 in 1964, $6.65 in 1965, and $6.30 in 1966.[5]

The port of Pepel, 83 railroad kilometers from the mine, was dredged, opening it to 40,000-ton vessels. In September a 30,000-

[4] Skillings Mining Review. V. 57, No. 5, Feb. 3, 1968, p. 17.
[5] Bank of Sierra Leone. Annual Report and Statement of Accounts. 1966, 61 pp.

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ton trial cargo of Marampa iron ore arrived at the Tokai steelworks of Fuji Iron & Steel Co. Ltd., Japan. Additional cargoes were due for later arrival at Yawata and Kawasaki. A long-term contract for iron ore was under negotiation between DELCO and Asoma Corp., agent for Fuji Iron & Steel Co. Ltd.[6]

Rutile.—The mine of Sherbro Minerals Ltd. was officially opened on February 6 and shipments to Europe and the United States began in June. The initial production rate is 100,000 tons of rutile concentrate (95 to 97 percent TiO_2) annually. Sales contracts already negotiated permit expansion, which is underway.

Alluvial material is mined by a 20-inch floating suction dredge. A slurry is piped to a wet plant, where a heavy mineral concentrate is recovered by gravity methods. The concentrate is fed to a dry plant, where rutile is recovered by electrical and magnetic separation methods.

Shallow water in the Sherbro Estuary precludes direct loading of ocean-going ore carriers. Rutile concentrate is hauled 24 kilometers to Port Niti in covered hopper trucks and transferred to 2,000 ton-capacity barges for haulage 29 kilometers downriver to bulk carriers offshore. Mining and concentrating units are of Australian origin. Total development costs were estimated at $18 million, including a $10 million Export-Import Bank loan. A staff of 50 United States and European technical personnel and 300 Leoneans will conduct the operation. Company authorities state that their product is competitive in world markets at $80 to $90 per ton in bulk shiploads at port under long-term contracts.[7]

NONMETALS

Diamond.—Output in 1967 apparently decreased in both quantity and value. While the number of carats produced has remained fairly uniform in recent years, total value has dropped because of the decreasing proportion of gem stone diamond. The gravels mined have been thinner and deeper, increasing mining costs. Sierra Leone Selection Trust (SLST) mining activities[8] during the fiscal years ending June 30 of 1966 and 1967 were as follows:

	1966	1967
Diamond production..carats ..	704,249	685,696
Gravel processed cubic yards ..	713,966	775,065
Stripping do....	3,291,496	3,574,855

The Government Diamond Office (GDO), which is managed by Diamond Corporation of West Africa Ltd., purchased all SLST output as well as that of "diggers" under the Alluvial Diamond Mining Scheme. GDO reported purchases during 1965 and 1966 as follows:

	Thousand dollars	
	1965	1966
Diggers	$31,892	$26,716
SLST	18,836	23,363
Total	50,728	50,079

SLST sales during the fiscal year ending June 30, 1967, totaled $20.2 million, suggesting a decrease in value of output during calendar year 1967.

By Executive Order of February 22, 1966, the diamond export duty was raised from 5 percent to 7.5 percent, and a 10-percent rate was planned in the 1967-68 budget. During 1966 the GDO attempted to pass this added cost on to the diggers in the form of lower prices, thereby causing greater incidence of smuggling. The GDO then began absorbing most of the cost and smuggling subsided. During 1967, a greater incidence of smuggling was again suspected, and the Government made renewed efforts to curb it.

Following negotiations which began in October 1966, the Government and SLST reached a new agreement[9] on company operation of its mining leases at Yengema, Kono District, and Tongo, Kenema District. The agreement, which was ratified by the Parliament on February 2 and became effective July 1, 1967, involved SLST tax liability (which was increased, although certain tax concessions were made), relinquishment of a 65-square-kilometer

[6] Metal Bulletin. No. 5228, Sept. 5, 1967, p. 17.
[7] Wall Street Journal. Apr. 14, 1967, p. 11.
[8] Consolidated African Selection Trust Ltd. Annual Report 1967, year ending June 30, 1967. Selection Trust Building, London, 1967, 28 pp.
[9] Sierra Leone Trade Journal. V. 7, No. 1, Jan./Mar. 1967, pp. 22–23.

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area to other licensed mining, increased propecting and production, more rigid security to discourage smuggling, mined-out land rehabilitation, accelerated training of Sierra Leoneans, and continued efforts toward improvement of working conditions and housing.

By National Reformation Council Decree No. 18 of June 7, 1967, all licensed alluvial dealers were assessed a special development levy, payable within 48 days. This tax, imposed to provide badly needed revenue, caused a virtual standstill in diamond buying for a short time. Authorities were persuaded to reduce assessments and extend payment periods to ease the situation.

The new diamond cutting and polishing plant in Freetown, owned jointly by the Sierra Leone Government, Leon Tempelsman and Son, New York who will act as managers, SLST, and the Diamond Corporation of West Africa Ltd., completed its second year of operation. Rough diamonds are received from the GDO. Sierra Leoneans were in training for technical and administrative duties under the tutelage of six expatriate instructors. The new company, Sierra Leone Diamonds Ltd., was granted a 10-year monopoly in the cutting and polishing field.[10]

MINERAL FUELS

Petroleum.—Ground breaking for the new 10,000 barrel-per-day petroleum refinery in Freetown took place in March 1967 with completion scheduled for May 1968. An agreement for the construction and operation of the refinery was signed in 1966 by the Government, by Haifa Refineries Ltd., which will act as managers, and by two Japanese construction firms—Nissho Co., Ltd., and Nigata Engineering Co. Ltd. Estimated cost is $5.3 million, financed by Nissho (75 percent) and Haifa (25 percent) on long-term credits.

The Suez Canal closing resulted in greatly increased ship bunkering at Freetown, where storage capacity is approximately 450,000 barrels, including British Admiralty stocks.

[10] Page 16 of reference cited in footnote 5.

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The Mineral Industry of the Republic of South Africa

By Thomas C. Denton [1]

In 1967 the mineral industry continued to hold the dominant position in the South African economy that it has occupied for many years. Major factors contributing to its role were the large volume of foreign exchange earned by gold mining; more than sufficient production of coal, the Republic's only significant native source of energy; high employment; and large purchases from other home industries including agriculture. Statistics for labor and supplies consumed appear in the following tabulation:

		1965	1966
Average number of persons at work:			
White		82,492	83,898
Nonwhites		585,775	591,897
Total		668,267	675,795
Sources of nonwhite labor:			
Republic of South Africa	percent of total	37	NA
Former British Protectorates [1]	do	21	NA
Other [2]	do	42	NA
Salaries, wages, and allowances:			
Salaries and wages, including allowances, earned, white employees	million dollars	$337.7	$358.4
Wages earned, nonwhite employees	do	158.7	168.7
Total	do	496.4	527.1
Value of supplies and electric power consumed	do	598.8	613.5

NA Not available
[1] Botswana, Lesotho, and Swaziland.
[2] Includes Mozambique.

Note: Where necessary, values have been converted from South African Rands (R) to U.S. dollars at the rate of R1=US$1.40.

Despite a steady increase in the value of its production, the mineral industry's contribution to South Africa's gross domestic product (GDP) has slowly but steadily declined as that of the manufacturing industry has increased. The GDP, at 1958 prices, was 10.5 percent greater in 1967 than in 1966, when a GDP of $10,294 million was realized. The contribution of mineral industry to the 1966 GDP was 12.2 percent.

The Republic's contribution to world mineral supplies continued to be very large in the case of a number of commodities as shown in the following tabulation:

Commodity	South Africa's share of non-Communist world output of selected commodities (percent)			
	1964	1965	1966	1967
Gold	78	74	76	77
Platinum	57	60	63	66
Antimony	36	34	29	34
Chromium ore	34	31	34	NA
Vermiculite	33	33	30	30
Manganese ore	19	17	19	20
Vanadium	17	17	17	20
Uranium	17	14	17	21
Diamond	10	11	15	17
Asbestos	10	11	12	11

NA Not available.

[1] Africa specialist, Division of International Activities.

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Although the Republic's share of non-Communist world gold production continued to rise and in 1967 reached 77 percent, output declined somewhat, the first decline in 15 years; and it was authoritatively forecast that beginning in about 1971, production would fall steeply and perhaps cease by 2015 or earlier, if the gold price does not increase.

The South African Government continued its drive toward achieving maximum possible self-sufficiency. Mineral industry facilities tending to promote the objectives that were completed in 1966 and 1967 or that were in progress or firmly programmed at yearend, included the following: Expansion of an existing iron and steel plant, a new integrated steel and vanadium plant, a new integrated stainless steel plant, an electrolytic copper refinery, electrolytic tinning facilities, an electrolytic zinc refinery, an aluminum reduction facility, and two large nitrogenous fertilizer plants. In addition, oil search both onshore and offshore was stepped up.

Early in 1967 the third economic development program for the Republic, for the period 1966–71, was released.[2] The target growth rate in the real GDP is 5.5 percent annually. Of the 20 sectors of the economy taken into account 11 were estimated to have a growth potential greater than 7 percent, including petroleum and coal products (11 percent), basic steel products (8 percent), and basic nonferrous metals (8.5 percent). With 1965 as the base year, projections of production to 1971 of nine major mineral-based industries were as follows:

Sector	Million dollars	
	1965	1971
Gold mining, including uranium	1,142	1,208
Coal mining	108	157
Other mining and quarrying	526	701
Basic steel products	371	588
Basic nonferrous metals	115	189
Petroleum and coal products	280	430
Basic industrial chemicals	225	372
Metal products	655	928
Nonmetallic mineral products	258	343

PRODUCTION

As measured by the value of gold and silver produced, diamond sales, and local and export sales of other minerals, the value of South Africa's mineral production increased in 1967 to a record $1,802 million, nearly 2 percent higher than in 1966 and 27 percent higher than in 1963.

[2] Republic of South Africa. Economic Development Programme for the Republic of South Africa: 1966–71. Release by the Department of Planning, Pretoria in Dec. 1966, 155 pp.

Table 1.—Approximate value of mineral production

(Million U.S. dollars)

Commodity	1963	1964	1965	1966	1967
Gold (production)	960.8	1,022.7	1,073.2	1,086.7	1,075.3
Silver (production)	3.5	3.8	4.1	4.1	4.9
Diamond (sales of domestic production)	51.3	61.9	69.4	86.2	83.0
Local sales:					
Coal	85.1	91.2	105.2	107.2	113.5
Other minerals	83.6	97.0	117.6	112.3	124.5
Subtotal	168.7	188.2	222.8	219.5	238.0
Exports:					
Coal	9.7	9.9	8.7	6.8	8.2
Fissionable materials [1]	93.5	81.4	(2)	(2)	(2)
Miscellaneous minerals	129.4	150.8	285.9	365.2	392.5
Total	1,416.9	1,518.7	1,614.1	1,768.5	1,801.9

[1] Comprises uranium (U_3O_8).
[2] Included in other minerals. Estimated at $46.5 million in 1965, and in 1966 and 1967 U.S. imports of U_3O_8 from South Africa were respectively $29.4 million and $8.1 million.

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The record was achieved despite a marginal decline in gold production. Gold accounted for 60 percent of total value, copper 7.7 percent, coal 6.7 percent, and diamond 4.6 percent. The exports included $135 million of unspecified "other" mineral commodities. Principal items in this group by value are raw materials of platinum and other metals of that group, and uranium (U_3O_8).

The increase in value of local sales during 1963–67 largely reflects steady growth in domestic coal consumption and in manufacture from native raw materials of such items as iron and steel semimanufactures, ferroalloys, cement and asbestos products. During the same period the volume of local sales of chromite increased over 300 percent, and for manganese ore 36 percent; between 1963 and 1965, local sales of asbestos increased 113 percent.

Table 2.—Republic of South Africa: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Antimony, content of cobbed ore and concentrate	11,258	12,882	12,611	11,371	12,335
Beryl, about 11.7 percent BeO	386	137	48	r 21	104
Bismuth, content of concentrate kilograms	1,188	73	r 120	149	54
Chromite:					
44 percent or less Cr_2O_3	132,773	180,971	242,650	342,987	332,605
More than 44 percent to 48 percent Cr_2O_3	639,692	641,823	668,483	691,701	781,265
More than 48 percent Cr_2O_3	19,695	26,752	30,977	26,248	35,178
Total	792,160	849,546	942,110	1,060,936	1,149,048
Copper:					
Concentrate, metal content	r 642	r 4,979	r 5,997	r 124,661	127,534
Blister	39,470	42,461	40,284		
Fire refined	15,038	12,052	14,125		
Electrolytic e	1,800	2,200	3,000	3,000	3,000
Gold thousand troy ounces	27,432	29,112	30,554	30,880	30,533
Iron and steel:					
Iron ore, 50 percent or more Fe thousand tons	4,460	4,830	5,816	6,797	7,737
Manganiferous iron ore, 15 to 30 percent Mn thousand tons	50	147	208	289	285
Pig iron do	2,217	2,657	3,271	3,407	3,420
Ferroalloys and spiegeleisen do	224	230	332	336	358
Steel:					
Ingots and castings do	2,834	3,142	3,293	3,805	e 3,652
Semimanufactures	2,115	2,316	NA	NA	NA
Lead, metal content of ore	15		48	(e)	24
Manganese ore:					
Metallurgical:					
Over 30 to 40 percent Mn thousand tons	494	406	483	602	1,090
Over 40 to 45 percent Mn do	469	478	581	565	191
Over 45 to 48 percent Mn do	231	334	433	427	291
Over 48 percent Mn do	52	61	24	30	183
Subtotal do	1,246	1,279	1,521	1,624	1,755
Chemical:					
Over 35 to 65 percent MnO_2 do	52	34	40	68	56
Over 65 to 75 percent MnO_2 do	7	3	6	(1)	5
Over 75 to 85 percent MnO_2 do	3	5	1		1
Subtotal do	62	42	47	69	62
Total do	1,308	1,321	1,568	1,693	1,817
Monazite	2,087				
Nickel, electrolytic e	2,400	2,400	3,000	5,400	5,400
Platinum-group metals:					
Osmiridium (sales) e thousand troy ounces	5	4	4	4	4
Platinum and other, contained in concentrates, matte, and refinery products e thousand troy ounces	300	600	750	780	825
Silver do	2,737	2,917	3,132	3,134	3,064
Tantalum concentrate	29	6	3	2	5
Tin:					
Concentrates, metal content long tons	1,530	1,586	1,671	1,745	1,761
Metal, smelter production do	r 962	1,016	962	822	658
Titanium concentrates:					
Ilmenite	28,158				
Rutile	1,256				

See footnotes at end of table.

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Table 2.—Republic of South Africa: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals—Continued					
Tungsten ore and concentrate, 60 percent WO_3	8	4	4	8	27
Uranium, U_3O_8	4,111	4,032	2,669	2,981	3,048
Vanadium, fused oxide, 99.9 percent V_2O_5	2,255	2,077	2,461	2,771	3,425
Zircon, concentrates	2,402	--------	--------	---------	---------
Nonmetals:					
Andalusite	10,008	13,972	21,919	21,486	24,583
Asbestos:					
Amosite	70,414	70,103	73,241	87,033	86,090
Chrysotile	26,243	32,587	35,285	33,367	35,649
Crocidolite	89,965	92,891	109,879	130,523	121,824
Tremolite	52	--------	--------	---------	---------
Total	186,674	195,581	218,405	250,923	243,563
Barite	2,453	2,572	1,340	6,182	1,493
Cement—thousand tons	2,884	3,481	3,882	3,984	3,810
Clays:					
Bentonite	[1] 7,814	9,313	11,737	11,904	15,162
Fire clay	[1] 223,561	266,704	280,288	239,387	218,561
Flint clay	136,208	191,965	248,357	182,515	150,985
Fuller's earth	[1] 452	163	632	---------	1,149
Kaolin	[3] 34,355	39,458	[r] 44,344	40,519	32,834
Corundum	72	54	313	[r] 363	318
Diamond:					
Natural, gem and industrial—thousand carats	4,376	4,450	[r] 5,026	[r] 6,036	6,668
Manufactured, industrial—do	1,475	2,639	NA	NA	NA
Diatomite	200	495	976	218	585
Emerald crystals—kilograms	239	208	532	4,321	377
Feldspar	42,036	36,095	42,304	34,541	24,891
Fluorspar:					
Acid grade	7,539	6,066	4,835	22,984	33,799
Ceramic grade	16,632	2,129	4,829	4,646	4,188
Metallurgical grade	28,229	52,070	56,122	54,258	57,320
Total	52,400	60,265	65,786	81,888	95,307
Graphite	609	945	406	1,053	671
Gypsum	187,464	240,082	303,940	296,539	207,590
Limestone [3]—thousand tons	5,802	6,971	7,550	7,748	8,002
Lithium minerals	378	162	869	306	---------
Magnesite	93,256	84,770	86,898	93,301	80,012
Mica	2,141	3,115	2,269	2,234	2,311
Mineral pigments	3,966	4,975	4,741	5,767	8,632
Pyrite	418,551	432,475	428,294	481,184	552,740
Salt—thousand tons	198	300	331	314	317
Shale	176,180	233,611	246,849	254,144	241,901
Silicrete [4]	14,878	19,695	11,349	10,723	9,816
Silica and silica sand	275,107	324,304	375,202	411,696	412,683
Sillimanite	56,241	54,649	42,148	35,103	35,385
Sulfur, elemental, refinery byproduct	2,013	5,792	7,216	5,806	NA
Talc	6,864	6,617	9,241	8,645	9,136
Tiger's eye [5]	117	73	73	57	404
Vermiculite	89,591	101,488	115,131	103,175	101,501
Wonderstone (pyrophyllite)	1,855	1,704	3,626	6,271	4,618
Mineral fuels:					
Coal, marketable:					
Anthracite—thousand tons	1,152	1,315	1,247	1,077	1,280
Bituminous—do	41,302	43,602	47,213	46,865	48,019
Total—do	42,454	44,917	48,460	47,942	49,299
Carbon black	9,708	11,945	13,163	NA	NA
Petroleum refinery products:					
Gasoline—thousand 42-gallon barrels	5,107	12,038	11,260	13,491	NA
Kerosine, including aviation turbine fuel—thousand 42-gallon barrels	1,449	1,829	1,753	2,098	NA
Distillate fuel oil—do	3,918	8,880	8,869	10,000	NA
Residual fuel oil—do	4,662	10,715	8,226	10,550	NA
Miscellaneous products—do	835	1,406	1,098	1,480	NA

[e] Estimate. [r] Revised. NA Not available.

[1] Less than ½ unit.

[2] A natural alloy of osmium, iridium, small quantities of other platinum group metals, and gold, recovered by certain gold mines.

[3] Local sales.

[4] A rock containing up to 98.4 percent SiO_2.

[5] Decorative material resulting from oxidation and silicification of crocidolite.

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TRADE

Official trade statistics for the Republic of South Africa include imports and exports for Botswana, Lesotho, Swaziland, and the Territory of South-West Africa, but not interterritorial shipments among these political divisions. Although some copper and iron ore exports are believed to have originated in South-West Africa and Swaziland, respectively, the great bulk of imports are for South Africa itself.

In 1965 South Africa's chronic deficit in merchandise trade was the highest ever recorded, approaching $1,000 million; but there was distinct improvement in 1966, as shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports: [1]			
1965	588	1,485	39.6
1966	733	1,688	43.4
Imports:			
1965	418	2,459	17.0
1966	354	2,304	15.4
Trade balance:			
1965	+170	−974	XX
1966	+379	−616	XX

XX Not applicable.
[1] Excludes gold.

For many years South Africa has had a distinctly favorable balance of trade in mineral commodities, excluding gold. The improvement in the overall trade balance in 1966 was substantially assisted by a 25-percent increase in value of mineral export [3] and a 15-percent decline in value of such imports. At yearend the outlook was for a very substantial increase in exports of high value mineral commodities, particularly platinum raw materials, ferroalloys, and steel semimanufactures. If realized, the expected steady increase in exports of such items will to some extent cushion the decline anticipated for South Africa gold production.

In millions of dollars, major mineral commodity exports in 1966, besides diamond, included copper 125.7, "other" minerals (mostly platinum raw materials and uranium) 106, ferroalloys 41.6, asbestos 41.6, pig iron 29.7, iron and steel semimanufactures 27.7, manganese ore 26.0, iron ore 24.4, chromite 9.2, and vanadium 7.1.

Europe continued to be the Republic's major supplier and customer, with the United Kingdom still the most important trading partner. In 1967 exports to Europe totaled $1,018 million, 54 percent of South Africa's total 1967 exports, while imports from Europe amounted to $1,479 million, 55 percent of total imports. Asia was South Africa's fastest growing export market. Export to the rest of Africa increased by $40.1 million to $315.6 million. Exports to the United States in 1967 totaled $227 million, of which more than half comprised mineral commodities. Imports from the U.S. were about $449 million, composed mainly of such items as machinery and transport equipment, chemicals, cereals, petroleum products, textiles, fats, and oils.

The United States continued to depend heavily on South Africa for minerals, with the value of U.S. imports of mineral commodities from South Africa in 1967, excluding iron and steel semimanufactured, at $153.1 million, compared with $174.3 million in 1966 and $114.4 million in 1965. Principal U.S. import items from South Africa in terms of value in 1966 and 1967 are listed as follows:

Commodity	Value (thousands)	
	1966	1967
Diamond	$30,733	$61,124
Blister and refined copper [1]	56,828	32,670
Material containing over 10 percent nickel [2]	6,010	12,479
Ferroalloys	14,182	10,879
Uranium (U_3O_8)	29,394	8,146
Chromium ore	4,426	5,555
Asbestos	10,659	5,298
Manganese ore	5,081	5,075
Antimony ore	2,001	2,008
Total	159,314	143,229

[1] May include some South-West Africa copper.
[2] Principal value contained probably is platinum group metals.

[3] Including $290 million of diamond exports and reexports, of which an estimated $82 million represented South African diamond.

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Table 3.—Republic of South Africa: Exports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Antimony concentrate	18,959	17,679	United Kingdom 10,772; United States 5,706.
Beryllium ore	---	32	NA.
Bismuth concentrate...kilograms	934	218	NA.
Chromite	777,050	856,797	United States 569,030; United Kingdom 92,522; West Germany 86,352.
Copper:			
Concentrate	21,476	20,442	Japan 14,843; Chile 2,878; Portugal 1,883.
Blister and refined	[2] 83,526	[2] 125,157	United States 47,907; West Germany 30,244; Belgium 20,054.
Iron and steel:			
Iron...thousand tons	[2] 2,230	[2] 3,089	Japan 2,941; Netherlands 83; France 64.
Scrap	231	547	NA.
Pig iron, spiegeleisen, powder and shot:			
Pig iron	563,279	769,913	Japan 533,748; United States 121,402; South Korea 44,840.
Other	3,480	13,519	United Kingdom 11,303; Italy 1,947.
Ferroalloys:			
Ferrochromium	62,933	79,860	United States 50,688; Sweden 8,234; Canada 5,974.
Ferromanganese	157,598	156,877	United Kingdom 53,532; United States 29,949; Canada 19,414; Italy 19,150.
Ferrosilicon	16,202	25,726	Australia 5,054; United Kingdom 5,008; West Germany 3,585; Japan 2,570.
Other	302	6,732	Canada 2,512; West Germany 2,084; United States 1,591.
Total	237,035	269,195	
Steel ingots and other primary forms.	925	3,916	Sweden 3,231; Hong Kong 95.
Semimanufactures:			
Bars, rods, angles, shapes, and sections.	26,674	73,183	United States 31,628; United Kingdom 3,932.
Universals, plates, sheets	[r] 86,811	79,114	United States 15,529; United Kingdom 2,786.
Hoop and strip	2,393	2,833	NA.
Rails and accessories	9,000	14,169	NA.
Iron and steel wire	4,289	4,270	NA.
Tubes, pipes, fittings	18,537	21,066	United States 366; Netherlands 190.
Castings and forgings, rough.	637	1,226	United Kingdom 665; Bolivia 156; Chile 73.
Total	98,341	195,861	
Manganese:			
Ore	985,151	1,354,315	France 305,009; United States 289,118; West Germany 237,127; Netherlands 148,215; Japan 134,609; United Kingdom 111,885.
Electrolytic metal	5,104	5,977	United States 1,345; United Kingdom 1,012; Sweden 799; Canada 797.
Nickel:			
Ore and concentrate	826	---	
Matte and speiss	213	12	United Kingdom 9.
Metal, unwrought	1,094	1,286	United Kingdom 1,079; United States 93.
Platinum-group metals. troy ounces	1,067	128	NA.
Silver...thousand troy ounces	2,773	11,830	United States 10,694; United Kingdom 1,133.
Tantalite...kilograms	1,510	10,886	NA.
Tin concentrate...long tons	1,603	2,641	United Kingdom 1,664; Netherlands 940.
Tungsten concentrate	12	12	United Kingdom 11.
Uranium (U_3O_8)	[e] 3,000	NA	
Vanadium:			
Fused oxide	[r e] 2,359	2,759	Austria 1,008; United Kingdom 889; Japan 369.
Ammonium vanadate	58	64	NA.
Other ores and concentrates, n.e.s	2,112	1,659	United Kingdom 1,494.
Nonferrous metal scrap	485	909	Japan 473; United Kingdom 315.
Nonmetals:			
Andalusite, kyanite, and sillimanite	50,906	42,960	United Kingdom 15,758; Japan 14,414; West Germany 5,720.
Asbestos	224,668	233,513	United Kingdom 51,934; United States 42,691; Japan 27,470; Italy 17,208; Spain 13,172.

See footnotes at end of table.

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Table 3.—Republic of South Africa: Exports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals—Continued			
Barite	561	3,282	NA.
Cement, including refractory cements	r 46,250	92,184	NA.
Diamond: [4]			
Gem:			
Rough, thousand carats uncut.	2,204	2,630	United Kingdom 2,507.
Cut, unmounted ....do....	146	174	Belgium 88; Hong Kong 30.
Subtotal .....do....	2,350	2,804	
Industrial:			
Natural .....do....	23,090	19,996	Ireland 14,605; United Kingdom 5,298.
Manufactured .....do....	775	2,487	Ireland 2,484.
Subtotal .....do....	23,865	22,483	
Total .....do....	26,215	25,287	
Emerald crystals .....kilograms..	913	1,339	NA.
Feldspar	11,461	8,263	West Germany 3,416; Italy 3,166.
Fertilizers:			
Natural phosphates	12,599	465	NA.
Manufactured:			
Nitrogenous	r 4,856	2,367	NA.
Phosphatic	5,612	2,150	NA.
Potassic	146	15	NA.
Not elsewhere specified	r 1,844	2,074	Belgium 1,380.
Flint clay	39,748	110,675	NA.
Fluorspar	46,884	85,493	Japan 38,721; United States 16,336; West Germany 6,801; Australia 5,714.
Granite	93,642	115,150	France 29,199; Belgium 19,475; Italy 17,662; West Germany 16,367; Netherlands 15,928.
Graphite	101	42	NA.
Gypsum	12,798	8,014	NA.
Lime and limestone	2,190	3,104	NA.
Lithium minerals	-------	494	NA.
Magnesite	r 2,996	3,899	United Kingdom 2,629.
Mica	r 2,317	3,032	United Kingdom 1,628; West Germany 332.
Mineral pigments	2,431	1,907	NA.
Pyrite, sulfur content	1,359	-------	
Salt	30,711	31,581	NA.
Silica	1,327	1,178	NA.
Silicrete	110	103	NA.
Talc	169	181	NA.
Tiger's eye	151	160	NA.
Vermiculite	96,179	77,919	United Kingdom 24,745; Italy 12,812; West Germany 10,541.
Wonderstone (pyrophyllite)	3,010	5,583	NA.
Mineral fuels:			
Coal:			
Anthracite thousand tons..	553	503	Japan 236; Italy 140; Spain 60.
Other .....do....	789	610	NA.
Coke	916	1,230	NA.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels..	26	392	NA.
Kerosine .....do....	184	597	NA.
Distillate fuel oil .....do....	735	1,578	Ships stores 724.
Residual fuel oil .....do....	6,758	8,319	Ships stores 6,602; United Kingdom 655.
Lubricating oils .....do....	296	306	NA.
Nonlubricating oils .....do....	51	42	NA.
Lubricating greases	1,765	2,149	NA.
Jellies and waxes	6,710	10,338	United States 3,572; West Germany 2,000; Netherlands 1,720; United Kingdom 1,247.
Bitumen and oil residues	19,839	12,198	NA.
Pitch and pitch coke	1,043	196	NA.

e Estimate. r Revised. NA Not available.

[1] Source: Volume I of the official Foreign Trade Statistics of the Republic of South Africa for 1965 and 1966. The statistical territory of the volume includes Botswana, Lesotho, Swaziland, and the Territory of South-West Africa. Certain items appearing in Volume I that are known to have been produced largely in these political divisions have been omitted from the table.

[2] A small part may have originated in the Territory of South-West Africa.

[3] About half believed to have originated in Swaziland.

[4] Exports and reexports.

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Table 4.—Republic of South Africa: Imports of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	7,763	15,685	Netherlands New Guinea 3,499; French Guinea 1,886.
Scrap	279	87	NA.
Ingots and other primary forms	20,373	27,388	Canada 25,009; United States 1,669.
Semimanufactures	8,395	9,373	United Kingdom 3,098; Canada 2,648; United States 2,305.
Chromite	83,717	98,266	NA.
Copper and its alloys:			
Ore and concentrate	6,118	6,242	NA.
Scrap	2,313	188	New Zealand 107.
Ingots and other primary forms:			
Blister and other unrefined	3	-------	
Refined	32,997	39,094	NA.
Total	33,000	39,094	
Semimanufactures	3,806	4,037	United Kingdom 1,616; Belgium 546; Italy 280.
Iron and steel:			
Iron ore and concentrates	33	30	NA.
Scrap	11,366	13,273	NA.
Pig iron, spiegeleisen, etc	3,436	3,515	United States 1,450; Sweden 1,183.
Ferroalloys:			
Ferrochromium	16	15	NA.
Ferromanganese	4	-------	
Ferrosilicon	1,356	1,415	West Germany 1,232.
Other ferroalloys	249	298	United States 118; Belgium 42; United Kingdom 40.
Total	1,625	1,728	
Steel ingots and other primary forms	20,942	20,074	United Kingdom 3,492; Belgium 302.
Semimanufactures:			
Bars, rods, angles, shapes, and sections	256,928	20,487	United Kingdom 8,070; Italy 5,485; Belgium 2,301; West Germany 1,256; Sweden 1,149.
Universals, plates and sheets	466,705	129,895	United Kingdom 81,851; Netherlands 18,391; Japan 17,693.
Hoop and strip	5,072	3,572	United Kingdom 1,007; United States 568; Sweden 435.
Rails and accessories	160,503	6,316	Belgium 5,117; United Kingdom 446.
Wire	25,956	8,972	Belgium 4,855; United Kingdom 1,205; West Germany 667; Netherlands 645.
Tubes and pipes	28,157	23,546	United Kingdom 6,697; Japan 6,096; United States 3,236.
Castings, rough	7,492	7,670	United Kingdom 2,553; France 1,555; Belgium 1,148; West Germany 1,000.
Total	950,813	200,458	
Lead:			
Scrap	4,256	1,455	Ceylon 203; Australia 170; New Zealand 131.
Ingots and other primary forms	8,607	4,705	NA.
Semimanufactures	1,430	2,652	NA.
Manganese ore	518	945	NA.
Mercury, 76-pound flasks	810	3,356	Spain 2,579; Italy 287.
Nickel:			
Scrap	(2)	1	NA.
Ingots and other primary forms	13	11	NA.
Semimanufactures	r 561	392	United Kingdom 171; Italy 117; Norway 31.
Platinum, troy ounces	r 4,150	3,678	United Kingdom 2,266; United States 838.
Tin:			
Scrap, long tons	66	24	NA.
Ingots, do	447	386	NA.
Semimanufactures, do	36	53	United Kingdom 49.
Titanium, concentrate	34,210	12,563	Australia 12,524.
Tungsgen, ore and concentrate	200	433	Australia 239; South Korea 62.
Zinc:			
Scrap	157	-------	
Ingots and equivalent forms	37,215	39,022	Australia 1,677; Japan 390; Belgium 356.
Semimanufactures	709	388	United Kingdom 69; West Germany 32.
Metals not further specified	320	NA	

See footnotes at end of table.

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Table 4.—Republic of South Africa: Imports of mineral commodities [1]—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals:			
Abrasives: Emery, pumice, etc.	1,765	4,898	United States 133; United Kingdom 63.
Asbestos	8,603	11,306	Canada 149.
Barite	3,141	3,053	West Germany 693; Italy 195.
Borax	15	815	United States 752.
Cement	r 75,679	114,060	United Kingdom 5,177; Japan 2,639; West Germany 1,617.
Clays and refractory minerals	8,392	14,209	United States 4,126; United Kingdom 2,989.
Diamonds:			
Gem:			
Rough, thousand carats, mixed origin.	28	27	United Kingdom 22.
Unmounted, cut, etc.—do.	7	2	Belgium 1; Israel 1.
Industrial—do.	19,075	13,259	United Kingdom 5,235; Ireland 344.
Diatomaceous earth	3,090	3,280	United States 2,767; West Germany 406.
Fertilizers and fertilizer raw materials:			
Nitrogenous:			
Ammonium nitrate	3,093	10,090	France 6,064; West Germany 3,634.
Ammonium sulfate	42,873	24,716	West Germany 12,106; Netherlands 7,061; Belgium 2,722; Italy 2,495.
Urea	22,191	17,278	Netherlands 7,348; West Germany 6,690; Italy 1,497.
Phosphatic:			
Phosphate rock	175,121	175,865	United States 10,144.
Thomas slag	28,100	20,956	All from Belgium.
Other phosphate fertilizers, etc.	4,849	50,369	NA.
Potassic: Potash	140,721	131,543	West Germany 44,400; France 28,807; United States 20,621; Israel 13,954.
Manufactured fertilizers, n.e.s.	567	13	NA.
Graphite	445	428	United States 158; United Kingdom 58.
Gypsum, including plaster of Paris	3,506	4,674	West Germany 3,428; United Kingdom 1,209.
Magnesite	36,186	35,237	United Kingdom 4,082; Italy 2,994; Japan 1,640.
Mica	226	380	NA.
Mineral pigments	596	469	United Kingdom 237; West Germany 25.
Quartz and quartzite	45	117	NA.
Salt	2,114	1,757	United Kingdom 1,669.
Sulfur:			
Elemental	r 170,359	184,569	Canada 83,651; United States 80,311.
Pyrite	(2)	7,607	Spain 7,603.
Mineral fuels:			
Coal	24,096	651	NA.
Coke	r 33,221	25,892	NA.
Petroleum:			
Crude—thousand 42-gallon barrels	33,529	35,119	NA.
Partly refined—do.	4,030	5,072	NA.
Total—do.	37,559	40,191	
Refinery products:			
Gasoline—do.	6,418	7,037	NA.
Kerosine—do.	r 2,676	3,318	NA.
Distillate fuel oil—do.	3,361	4,452	NA.
Residual fuel oil—do.	583	130	NA.
Lubricating oils—do.	1,395	1,338	United States 497; United Kingdom 294; Netherlands Antilles 263.
Nonlubricating oils—do.	147	294	United States 168; United Kingdom 22.
Lubricating greases	3,334	4,201	United States 3,128; United Kingdom 500.
Jellies and waxes	23,061	21,752	United States 16,503; Japan 2,586.
Bitumen and oil residues and bituminous mixtures.	r 13,937	6,392	United States 1,942; Netherlands 1,776.
Pitch and pitch coke	1,287	15,356	NA.

r Revised. NA Not available.

[1] The statistical territory for the external trade of the Republic of South Africa includes Botswana, Lesotho, Swaziland, and the Territory of South-West Africa. No separate statistics for the trade between these territories are recorded.

[2] Less than ½ unit.

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COMMODITY REVIEW

METALS

Aluminum.—In 1966, Government-owned Industrial Development Corporation of South Africa (IDC) announced that a $56 million primary aluminum reduction facility would be built at Richards Bay, Natal Province, but commencement of construction was later postponed because of the credit squeeze the Republic was undergoing. IDC later announced that construction was expected to begin in May 1968 with the facility to go on stream by mid-1970. The plant would be the Republic's first such facility and would represent a significant saving of foreign exchange, although alumina for the facility would have to be imported because South Africa lacks bauxite deposits. The value of 1966 imports of aluminum in ingots and other primary forms was more than $10 million; $5 million worth of aluminum semimanufactures also was imported.

Antimony.—Again in 1967 Consolidated Murchison (Transvaal) Goldfields and Development Co., Ltd. (Murchison), was the only antimony producer in the Republic, and was an important supplier of the metal to the United States. Contained in concentrates, Murchison provided 19.4 percent of U.S. general imports of antimony in 1966, 26 percent in 1965 and 24 percent in 1964.

Murchison's mine in the Letaba district of Transvaal Province in 1967 recorded increases in tonnage of ore milled, concentrates and cobbed ore produced, and ore reserves, as shown in the following tabulation:

	1966	1967
Ore milled.....metric tons..	165,700	187,200
Concentrates and cobbed ore:		
Production...metric tons..	18,417	20,159
Average antimony content percent.....	62.03	61.19
Antimony recovery..do....	91.86	92.05
Gold production..troy ounces..	3,844	2,069
Reserves [1].....metric tons..	510,000	531,000

[1] Yearend reserves of ore deemed payable on basis of combined antimony and gold content.

At yearend consideration was being given to the advisability of making minor additions to plant (cost about $70,000) which would increase milling capacity by about 1,800 metric tons per month.

Chromium.—Virtually without exception, local sales of chromite have increased sharply each year since 1962, in part reflecting increased home ferrochromium manufacture from native chromite. Local sales in 1962 totaled 58,776 tons valued at $520,000, whereas such sales in 1967 were 244,440 tons valued at $1.9 million. The outlook was for still further increase in domestic consumption of native chromite, although substantial imports from Southern Rhodesia could be expected to continue.

Exports have ranged within rather narrow limits, reflecting fluctuations in world demand and in sales by the U.S.S.R. to some extent. The peak year of exports during 1962–67 was 1966, when shipments totaled 825,588 tons valued at $9.5 million. Preliminary figures indicate that 1967 exports totaled 701,128 tons valued at $8.8 million.

For the first time in history, chromium for production of low-carbon ferrochromium by RMB Alloys Pty. at Middleburg was derived from chemical or refractory grade chromite, obtained from the Winterveld mine at Steelport and the Millsell mine near Rustenburg, both in Transvaal Province. Metallurgical grade chromite, containing a higher chromium-to-iron ratio, had been the required grade. Success of a new process, worked out and perfected by South African metallurgists and engineers, improves South Africa's position for ferrochrome manufacture because South Africa's reserves of metallurgical chromite are limited whereas its reserves of chromite with a chromium-to-iron ratio of less than 3.1 are virtually inexhaustible.

Copper.—At yearend the Republic's significant primary copper producers, in order of size of output in 1967 were: Palabora Mining Co. Ltd. (Palabora) in northeastern Transvaal; O'okiep Copper Co. Ltd. (O'okiep) in the Nababeep area of Cape Province; the Messina (Transvaal) Development Co., Ltd. (Messina), at Messina, northern Transvaal; and Rustenburg Platinum Mines Ltd. (RPM) near Rustenburg, Transvaal Province.

Palabora, 28.8 percent owned by Newmont Mining Corp., probably achieved a world record for speed with which its large low-grade, open pit mine was brought to production and dividend pay-

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ments were begun. Stripping of the ore body began in 1964 and ore production in February 1966. Net income for that year was $36.6 million. Dividends paid totaled $9.9 million. Salient statistics for 1967 were as follows: Ore mined, 13.3 million tons averaging 0.71 percent copper; anode copper produced, 76,539 tons; net income, $50.5 million; dividends declared, $27.8 million. At yearend ore reserves were estimated to exceed 270 million tons averaging 0.69 percent copper.

As in 1966, net income in 1967 was not subject to income or royalty payments under the South Africa tax law. Such payments apply when cumulative profits exceed capital expenditures on a project, which was expected to occur about mid-1968.

Besides 77,000 tons of copper, Palabora's sales in 1967 included 99,000 tons of vermiculite, 93,000 tons of sulfuric acid, and 771,000 tons of magnetite.

During the year Palabora completed a 41,000-ton-per-year electrolytic copper refinery, and a wirebar casting plant was under construction. A continuous rod casting plant was scheduled for completion in 1968. The refinery is the only major source of electrolytic copper in South Africa and its capacity is sufficient to meet domestic requirements. The refinery thus represents both a saving in foreign exchange for South Africa and a further step in the Republic's drive toward achieving maximum possible self-sufficiency.

O'okiep, 57.5 percent owned by Newmont Mining Corp., produced 38,600 tons of blister copper in 1967, 900 tons less than in 1966. Total sales amounted to $43,074,000 compared with $55,991,000 in 1966. Net income at $15,174,000 was $10 million lower than in 1966, chiefly reflecting lower copper prices and higher operating costs. Dividends paid totaled $17,868,000 compared with $20,013,000 in 1966.

In 1967 the company milled 2.9 million tons of ore averaging 1.51 percent copper (2.8 million tons averaging 1.52 percent in 1966). At yearend ore reserves were estimated at 23 million tons averaging 1.73 percent copper compared with 23.9 tons averaging 1.81 percent copper reported as of June 30, 1966.

Exploration of the company's properties was substantially increased. While no new discovery was made, considerable additional ore adjacent to known ore bodies was found.

Directly and through subsidiary companies, Messina operated the Messina mine and smelter in South Africa and three mines and a smelter in Southern Rhodesia. After providing for taxation and minority shareholder's interests, Messina reported a profit for the year ended September 30, 1967 of $7.98 million compared with $13.4 million in fiscal 1966. The profit decline was attributed to the following factors: (1) the average price realized for copper sold was $228.20 per long ton less than in 1966; (2) since there was an increase of 10 percent in the South African rate of taxation and the Rhodesian mines bore full tax on their aggregate profits, taxation was only $117,600 less than in fiscal 1966 despite appreciably lower operating profits. Dividends declared totaled $4.48 million, compared with $5.52 million in fiscal 1966. The average price at which Messina and subsidiary companies sold copper in fiscal 1967 was approximately the equivalent of 49.3 U.S. cents per pound.

The combined output of Messina-owned smelters in fiscal 1967 was 29,326 tons of fire refined copper, compared with 27,477 tons in fiscal 1966. To these totals Messina's South Africa smelter contributed 11,754 tons in 1967 and 12,458 tons in 1966. Proved ore reserves in Messina mine on September 30, 1967, were reported as 5.9 million tons averaging 1.42 percent copper, virtually unchanged from the previous year.

Although primarily a producer of platinum group metals, RPM also produces appreciable electrolytically refined copper as a byproduct. The quantity produced is not disclosed but in 1967 may have been 3,000 tons or more.

Gold.—Mines in the goldfields of the Witwatersrand and Evander sedimentary basins which are members of the Transvaal and Orange Free State Chamber of Mines account for all but a few hundred thousand ounces of South Africa's annual gold production. As a result of favorable developments in those fields, a strong upward trend in the Republic's gold production began in 1952, when output was 11,818,681 ounces. The trend continued upward without interruption until 1967 when occurred the first decline in 15 years. Pro-

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duction was 348,000 ounces lower than in 1966 and 21,000 ounces lower than in 1965.

The concensus of competent South African opinion is that important new discovery in the sedimentary basins appears unlikely. If none occur, a steep production decline is forecast beginning in about 1971; and by 2015 or earlier, production from the basins may cease.[4]

The forecasts, covering existing producers and new mines financed as of June 1966, assumed throughout a fixed gold price of $35 per ounce and three separate cases with respect to annual escalation of operating costs: (1) costs remain at the 1966 level; (2) a 2-percent increase in costs; (3) and a 4-percent increase in costs. Cost escalation in the industry reportedly was 4.6 percent in 1965 and 4.9 percent in 1966. Total ounces remaining to be produced (excluding the possible opening of new mines) are shown as follows: Case 1—618 million, case 2—528 million, case 3—448 million.

Forecasts for annual gold production are as follows:

Year	Expected production (million ounces)		
	Case 1	Case 2	Case 3
1971	31	32	33
1978	23	23	21
1982	18	15	8
1986	12	8	4
1989	8	4	0
1996	4	0	0
2015	0	0	0

A South African journal commented that if in the next decade gold production declined at the indicated rate, merchandise exports would have to rise at an annual rate of 8 percent, double that realized in recent years, in order to maintain the economic growth rate achieved over the past 10 years.[5]

Besides the decline in output, salient aspects of gold mining by Chamber mines in 1967 compared with 1966 included a further decline in the number of mines operating, virtually no change in ore

[4] Gold Producer's Committee of the Transvaal and Orange Free State Chamber of Mines. The Outlook for Gold Mining. Johannesburg, 1967.
[5] South African Mining and Engineering Journal (Johannesburg). V. 78, No. 3905, Dec. 8, 1967, p. 3033.

Table 5.—Salient statistics of gold and uranium production by members of the Transvaal and Orange Free State Chamber of Mines

	1965	1966	1967
Number of operating mines	53	52	49
Ore milled—thousand short tons	80,027	78,250	77,475
Gold produced:			
Gross weight—thousand troy ounces	30,102	30,427	29,971
Per ton of ore milled—troy ounce	.3760	.3888	.3868
Number of mines producing uranium ore	7	8	8
Ore treated for uranium recovery—thousand short tons	8,160	9,502	10,500
Uranium oxide (U_3O_8) produced:			
Gross weight—thousand pounds	5,885	6,572	6,427
Per ton of ore milled—pounds	.72	.69	.61
Working revenue, excluding uranium—thousands	NA	$1,060	NA
Average realized gold price per ounce [1]	$35.13	$35.20	$35.22
Working profit, gold and uranium—thousands	$465,030	$455,678	$431,126
Taxation and mineral lease consideration payable to the government—thousands	$180,460	$193,792	$167,934
Net dividends—do	$177,904	$176,030	$171,451
Average number of employees in service:			
Whites	44,098	43,439	42,296
Nonwhites	375,329	370,469	361,893
Development footage, including shaft sinking—thousand feet	3,177	3,064	3,023
Payable ore reserves—thousand short tons	176,018	173,910	167,029
Average grade of reserves—troy ounces per ton	.444	.457	.470

[1] Figures reported for 1965, 1966 and 1967 were respectively 25.09 rands, 25.14 rands and 25.16 rands.
Source: Union Corporation Ltd. report and accounts for the year ended December 31, 1967. Statistics published by the Transvaal and Orange Free State Chamber of Mines.

tonnage milled or gold recovery per ton, and a significant decrease in the labor force. Operating profit fell to $431 million and net dividends to $171 million.

In the aggregate, mines administered by Anglo American Corporation of South Africa Ltd. continued to be by far the largest contributor to total South African gold production. Their combined output in 1965, 1966 and 1967, in thousands of

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ounces, was respectively 11,458, 12,140 and 12,110.

Iron and Steel and Ferroalloys.—The industry continued to grow. On the basis of figures reported for the first 9 months, production of steel ingots and castings in 1967 was 10 percent higher than in 1966. Pig iron output rose 0.4 percent, while ferroalloy production was up 6.5 percent from that of 1966. Iron ore production registered the sharpest increase, nearly 1 million tons compared with that of 1966, and 33 percent higher than in 1965.

The Government controlled and operated South African Iron and Steel Industrial Corp. Ltd. (ISCOR), which accounts for over 80 percent of the Republic's iron and steel production, in recent years has increased to about 60 percent the share of its iron ore requirements that it mines at Sishen in Northern Cape Province. At yearend ISCOR's prospecting program in an area between Sishen and Postmasburg had established the existence of large reserves of rich ore, occurring from outcrops to depths of 900 meters. The total reserve with iron content more than 60 percent was estimated at about 3,876 million tons. ISCOR was contemplating the possibility of exporting ore from Sishen in progressively larger tonnages, to reach a total of 500 million tons by the year 2000. This could result in an average annual income of about $168 million.[6] Such a project presumably would require establishment of a deep water ore port on the West Coast, in either the Republic or the Territory of South-West Africa.

ISCOR's net profit for its fiscal year ended June 30, 1967, before taxation, was $30.7 million, 31 percent higher than in fiscal 1966. The increase was partly due to larger sales volume and partly to increased revenue from sales resulting from a decision taken in 1966 to absorb into selling prices the steel import levies that had prevailed earlier. The net sales value of all products sold in 1967 was $261.6 million compared with $223.7 million in fiscal 1966.

Production of molten iron from ISCOR's two works, Vanderbijlpark and Pretoria, totaled 2.75 million tons, 4.2 percent more than in 1966. The Vanderbijlpark plant contributed 2.21 million tons and the Pretoria plant 1.17 million tons. Steel ingot output was 2.86 million tons, up 10.3 percent from fiscal 1966.

ISCOR reported that in accordance with Government measures to curb inflation, it would delay to the extent feasible further spending on its expansion program, but expected to reach an annual output of about 4.7 million ingot tons by 1970. The projected third works was temporarily postponed.

The $16.1 million stainless steel plant, first in South Africa, of Southern Cross Steel Co. (Pty) Ltd. (SC), near Middleburg, Transvaal Province, was officially inaugurated in May. SC is owned by Rand Mines and others (48 percent); Eastern Stainless Steel Co., Baltimore, Md. (32 percent); and Anglo American Corp. of South Africa Ltd. (20 percent). RMB Alloys, owned by the Rand Mines group, supplies SC with low-carbon ferrochrome from an adjacent plant.

The annual production capacity of the SC plant was reported to be between 72,000 and 91,000 tons of rolled stainless steel. SC applied for a 30-percent tariff against imports of competitive stainless steel products.[7]

Ferroalloys.—The Republic's ferroalloys production has increased each year during the past 7 years, and at yearend the outlook was for further growth. At 358,000 tons, production in 1967 was nearly 200,000 tons more than in 1961. Exports were valued at $41.6 million, of which ferrochrominum and ferromanganese accounted for 46 percent and 43 percent, respectively. The chairman of the Ferroalloys Producers' Association has predicted that by 1980 South Africa would be earning $280 million a year from exports of ferroalloys, chiefly ferrochromium and ferromanganese.[8]

In December, The Associated Manganese Mines of South Africa Ltd. (AMM) announced that the issued capital stock of AMM's wholly owned subsidiary, Feralloys Ltd., was increased from 2 million to 2.9 million shares, by alloting 900,000 shares to the United States Steel Corp. (USS) at $4.33 (R3.09) per share. USS had subscribed for the shares and in addition would lend Feralloys $2.4 million (R1,719,000). AMM would arrange for any additional loans needed to complete an expan-

[6] South African Iron and Steel Industrial Corp. Ltd. Annual Report. 1967, p. 8.
[7] U.S. Consulate general. Johannesburg, Republic of South Africa. State Department Airgram A-17, July 13, 1967, p. 14.
[8] Work cited in footnote 7.

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sion program estimated to cost $11.2 million.[9]

It is believed that upon completion of the program Feralloys Ltd. will be by far the largest producer of ferromanganese in South Africa.

During 1967 South African Manganese Ltd. contracted to sell 80,000 tons of ferromanganese to two Japanese steel companies for delivery between July 1968 and June 1969.[10]

Manganese.—Including a nominal tonnage of manganiferous ore (15 to 30 percent manganese and 20 to 35 percent iron), local sales of manganese ore in 1967 totaled 615,070 tons valued at $6.8 million free on rail (f.o.r.) compared with exports of 1.45 million tons valued at $25.8 million f.o.b. which included 127,000 tons of manganiferous ore. The volume of local sales was 20,000 tons higher than in 1966 and a further increase in such sales was expected. Total 1967 sales included 564,000 tons of metallurgical grade ore, 63 percent of which was identified as containing "over 30 to 40 percent" manganese. Sales of chemical grade ore were 51,000 tons valued at $600,000 f.o.r. From its mines in the Postmasburg area of Northern Cape Province, The Associated Manganese Mines of South Africa (AMM) shipped 681,000 tons of manganese ore and 1.04 million tons of iron ore in 1967 compared with 707,000 tons and 839,000 tons, respectively, in 1966. AMM reported for 1967 consolidated net profit of $2.92 million after taxation and lease considerations amounting to $1.42 million. The profit was $1.68 million lower than in 1966, in part due to the reduced manganese ore shipments and to increased rail freight rates introduced in September 1966.[11]

In 1966 Electrolytic Metal Corp. (Pty.) Ltd., controlled by Federale Mynbou-General Mining, completed expansion of its electrolytic manganese plant on the West Rand. Annual capacity was increased from 5,000 tons of metal to 7,500 tons, and the outlook at yearend 1967 was for a possible further increase. Exports of the metal in 1966 of 5,977 tons were valued at $3 million.

Platinum.—At yearend Rustenburg Platinum Mines Ltd. (RPM) still was the only significant producer of platinum group metals in the Republic, but during the year Union Corp. Ltd. (UCL) announced that it expected to begin production by yearend 1969 from a property to be opened in the Rustenburg area; annual capacity reportedly will be not less than 100,000 ounces of platinum.

Rustenburg Platinum Mines Ltd. (RPM) does not report output. For the fiscal year ended August 31, 1967, RPM reported that platinum demand at the company's producer price continued to exceed available supplies. Refined platinum output increased steadily during 1967 and all of it was sold. Byproduct metal production (palladium, rhodium, iridium, ruthenium, gold, copper and nickel) increased in proportion to platinum production, and for the most part, refined output was promptly sold.

The price of RPM platinum, which had been the equivalent of $100.10 per troy ounce since the beginning of 1965, was increased to $109.20 on January 23, 1967. The quoted prices for metal available to the free market, mainly from U.S.S.R. sources, increased from an average of $143.50 per troy ounce during the year ended August 31, 1966, to an average of $156.80 during the year ended August 31, 1967. The free market price increased to $196 as of November 10, 1967.

Progress on two expansion programs announced during 1967 and earlier was on schedule. It was expected that the combined production capacity of RPM's two mines (Rustenburg and Union) would reach 750,000 ounces of platinum per year toward yearend 1968, and 850,000 ounces per year toward yearend 1969.[12]

A consortium headed by the Central Mining/Rand Mines group of South Africa holds the mineral rights to a farm (Braks-pruit) adjacent to RPM's Rustenburg mine, in which RPM operates on a royalty basis. RPM continued to make regular deliveries to the consortium of platinum and associated metals mined from this source, in the form of converter matte and "metallics" (blanket table concentrates). Much of this material was shipped to the United States for extraction and refining of the platinum group metals. The con-

[9] Associated Manganese Mines of South Africa Ltd. 1967 Annual Report, p. 3.
[10] Engineering and Mining Journal. V. 168, No. 12, December 1967, p. 142.
[11] Work cited in footnote 9.
[12] The Bureau of Mines estimates roughly that RPM produces about 0.33 ounce of combined by-product platinum group metals for each ounce of platinum produced.

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sortium advised RPM that, as from April 1968, it wished to take maximum quantities allowed under its agreement with RPM.

The following tabulation provides salient financial statistics for RPM in 1966 and 1967:

	Year ended August 31 (million dollars)	
	1966	1967
Net revenue from metal sales	25.3	36.2
Taxation and State's share of profits and loan portion of normal tax	7.5	14.3
Profit after tax and other adjustments	16.6	20.6
Dividends paid	12.8	11.6

Subject to Government approval, Johnson Matthey and Co. of South Africa (Pty.) Ltd. will build a platinum refinery at Waderville, with RPM participating in financing the plant, which is expected to go on stream early in 1969. Capacity and production will be large enough to permit export sales.

Uranium.—In 1967 South Africa's Minister of Mines and of Planning announced results of a reassessment of the country's estimated, exploitable uranium reserves at various assumed prices. The new estimate was as follows:

Price range per pound	Contained U_3O_8 (thousand metric tons)	
	Reasonably assured reserves	Possible additional reserves
Under $10	186	14
$10 to $15	245	32
$15 to $30	295	64

Early in 1966 the uranium section of the gold mining industry was adversely affected by a reduction of sales quotas, but by yearend additional sales were concluded. Eight mines were producing uranium in 1967. At 0.30 kilogram per metric ton, uranium recovery per metric ton of ore treated was 0.04 kilogram less than in 1966.

Vanadium.—At yearend the $164 million iron, steel and vanadium complex of Highveld Steel and Vanadium Corp. Ltd. (SVC) in Transvaal Province sponsored by Anglo American Corp. of South Africa Ltd. was nearing completion. Besides production of steel- and vanadium-rich slag by Highveld, the project comprises of, through the wholly owned subsidiary companies, Ironstone Minerals (Proprietary) Ltd. and Transvaal Vanadium Co. (Proprietary) Ltd. and SVC's Vantra Division, production of vanadium pentoxide and mining of raw materials for the metallurgical facilities.

The iron-vanadium raw material is titaniferous, vanadiferous magnetite that is open-pit mined from the Bushveld Igneous Complex, in which vanadium content varies from 1 to 2.5 percent. In the Highveld steel process the ore, mixed with fluxes and coal, is prereduced in a rotary kiln and then fed into a submerged arc furnace for smelting to vanadium pig iron. Vandium recovery in the pig iron is around 90 percent. The molten pig iron is partially blown with oxygen in an acid-lined shaking ladle to remove the vanadium in high-grade slag. The blown iron is then transferred to a basic Linz-Donawitz converter for steelmaking. In 1967 the vanadium-rich slag was to be exported to the United States and Europe. United States tariff considerations dictated the production of vanadium in slag rather than as a higher grade product.

The Vantra Division of SVC produces high-purity vanadium pentoxide from the magnetite by chemical processes. In 1966 output was more than 2.7 million kilograms, and when SVC reaches capacity production, South Africa may become the world's largest producer of primary vanadium raw materials.

NONMETALS

Asbestos.—Total value of South African asbestos output in 1967, as measured by local sales plus exports was $37.3 million compared with $40.6 million in 1966; the decline was the first in the annual value of asbestos production in some years, and reflected a decline in volume both of local sales and exports. Compared with 1966 levels, value per unit increased 4 percent for local sales and decreased 1 percent for exports.

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The tabulation that follows shows the contribution of each variety of asbestos to total value:

	Thousand dollars			
	Local sales [1]		Exports [1]	
	1966	1967	1966	1967
Amosite	532	288	11,952	11,824
Chrysotile	1,232	1,373	2,794	1,544
Crocidolite	1,332	1,170	22,734	21,143
Total	3,096	2,831	37,480	34,511

[1] Local sales values are f.o.r.; export values are f.o.b. port of shipment.

The Koegas mine of Cape Blue Mines (Pty.) Ltd., a subsidiary of Cape Asbestos South Africa (Pty.) Ltd., and the world's largest crocidolite producer, in 1966 changed from the resue method of mining to a system of channel mining, which proved to be more rapid and minimized loss of fiber in fill.

The Penge mine of Cape Asbestos Company continued to be the only significant producer of amosite asbestos in the non-Communist world. Because of increasing world demand for amosite, Cape Asbestos was expanding mining and milling operations at Penge. In 1967 three mines were operating, with total monthly ore output of 93,000 tons. Two new mills were approaching completion.[13]

Diamond.—The Republic's production of natural diamond has increased each year for more than 8 years and in 1967 was 112 percent larger than in 1960. Of total 1967 output, 93.7 percent was produced from kimberlite and 6.3 percent from alluvial deposits. The comparable figures for 1966 were 91.7 percent and 8.3 percent, respectively. Compared with 1966 results, sales volume also rose in 1967 by 15.5 percent, but value fell by nearly 4 percent to $83.03 million.

Through its Central Selling Organization, De Beers Consolidated Mines Ltd. accounts for approximately 80 percent of non-Communist world sales of raw diamond. Sales in 1967 at $492 million were nearly 2 percent lower than in 1966, despite a price increase of about 7½ percent that became effective in August 1966. The decline reflected a relatively quiet market that began in March and continued to yearend. Beginning in January 1968, however, demand improved and it was hoped that sales in 1968 would resume the upward trend of the past several years. Diamond stocks (held by The Diamond Corp.) increased by $45.5 million to $94.8 million at yearend 1967, reflecting the decline in sales, increased output by De Beers' Finsch mine, and increased purchases by The Diamond Corp. from sources outside the De Beers group of companies. With respect to this situation the chairman remarked: "In the present disturbed monetary conditions I do not regard this increase as altogether undesirable."[14]

The 1967 output of the De Beers group of companies was about 6,246,000 carats, or about 97 percent of South Africa's total production. To this total the Premier Mine contributed 2,376,879 carats (2,500,299 in 1966) and the new and important Finsch mine 1,816,960 carats (900,500 carats in 1966).

Sales of industrial diamond were at a high level during 1967, with sales of drilling material considerably higher than in 1966, mainly reflecting additional supplies of such diamond that became available from the Finsch mine. Production and sale of synthetic grit also increased; the purchase by De Beers of a 50 percent interest in Scandiamant Aktiebolag of Sweden both supplemented De Beers' synthetic production in South Africa and Ireland and broadened the range of grits available to the consumer. De Beers' success in 1966 in manufacturing larger sizes of synthetic grit made possible invasion of the marble and concrete sawing market with the new product. Further significant progress was made in research, particularly in grinding steel, a potentially large field not yet open to diamond abrasive wheels.[15]

Fluorspar.—In 1967 South Africa produced 95,000 tons of fluorspar of which 34,000 tons was acid grade material, and at yearend a Government report had been issued that indicated the Republic could become one of the world's largest producers of fluorspar insofar as adequacy of reserves and resources is concerned.[16]

[13] World Mining. V. 3, No. 7, June 1967, p. 17.
[14] Oppenheimer, H. F., chairman. De Beers Consolidated Mines Ltd. Statement accompanying Annual Report for 1967. p. 2.
[15] De Beers Consolidated Mine Ltd. 1967 Annual Report.
[16] Republic of South Africa, Natural Resources Development Council. Investigation Reports on the Processing of Certain Minerals in the Republic of South Africa and in South-West Africa. V. 5. Fluorspar. 1967, 57 pp.

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The report estimated South Africa's reserves and resources as follows:

	Million metric tons	
	Quantity of ore	Contained CaF_2
Proved ore reserves	15.4	5.4
Estimated ore reserves	10.9	5.4
Total economic reserves	26.3	10.8
Potential ore reserves	272.1	45.4

MINERAL FUELS

Petroleum.—The search for oil was pursued vigorously throughout 1967. Southern Oil Exploration Corp. (SOEKOR), wholly Government owned, was set up in 1965 to undertake, encourage, or assist in oil search in any apparently promising area in the Republic and in the Territory of South-West Africa. In an address early in 1968 the general manager of SOEKOR was optimistic about finding oil. At year-end SOEKOR had 12 offshore lessees including eight major oil companies and two independent companies. The sublease conditions provide annual work obligations, primarily geophysical surveys, during the first 3 years, with drilling to begin in the fourth year. Commitments of the first 12 months for the offshore lessees beginning July 1, 1967 totaled $1.4 million whereas actual expenditures in the first 6 months were $1.75 million. Seismic work in the Port Elizabeth area confirmed thicknesses of Cretaceous sediments up to 2,400 meters.[17]

A State-owned 40,000-barrel-per-day refinery is scheduled to be completed in 1970. The Government would control the plant but Total, Iranian Oil and other companies, would share in the ownership.

Caltex Oil plans to expand its Cape Town refinery. Daily crude capacity will be increased to 50,000 barrels, a 26,500-barrel-per-day vacuum unit and an 11,000-barrel-per-day catalytic cracker added; and daily hydrotreating capacity will be increased to 10,000 barrels.[18]

[17] South African Mining and Engineering Journal. V. 79, No. 1, Mar. 29, 1968, p. 701.
[18] Oil and Gas International. V. 8, No. 2, February 1968, p. 73.

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The Mineral Industry of the Territory of South-West Africa

By Thomas C. Denton [1]

Particularly with respect to prospecting and exploration, the mineral industry of the Territory of South-West Africa enjoyed an active year in 1967, and it continued to be the major sector of the economy.

Although statistics of production, local sales, and exports are lacking for 1967, the value of production is indicated to have approximated the 1966 value, which in turn was appreciably higher than in 1965. The Territory continued to be a major non-Communist primary source of vanadium and to contribute about 25 percent of world sales of raw gem diamond of the finest quality.

At the end of 1966 the number of companies and individuals engaged in mining totaled 30. About 46 concessions were in force, covering exploration rights for diamond, petroleum, and nonmetallic minerals; numerous concessions covered "all minerals," among which copper was of major interest.

Early in 1967 the Territory's Administration announced new rules governing foreign investment in mining. These rules provided that when a company controlled by persons who are not citizens of South Africa seeks mining rights in the Territory, the company must make part of its shares available to the South-West Africa Administrator, who will designate one or more bodies that will be allowed to purchase such shares. The Administrator will determine the percentage of shares to be made available, which may not exceed 50 percent. Despite this development there was a sharp increase in exploration activity, involving at least two United States companies. Grants and Mining Areas fees collected by the Inspector of Mines totaled $123,749 [2] in 1966, about 20 percent more than in 1965, and fees collected for prospecting licenses were 14 percent larger.

PRODUCTION

The combined value of exports and $539,000 of local sales of metals and minerals (approximately equivalent to value of production) was $178 million in 1966, 11 percent higher than in 1965. Diamond accounted for about 66 percent of the 1966 total value and blister copper and refined lead accounted for about 15 percent and 10 percent, respectively. Some 20 additional minerals and metals were produced, including tantalite, cesium ore (pollucite), and lithium minerals.

[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from Republic of South Africa Rands (R) to U.S. dollars at the rate of R1=US$1.40.

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Table 1.—South-West Africa: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity [2]	1963	1964	1965	1966
Metals:				
Arsenic, white	------	--------	--------	40
Beryl, 10 to 12 percent BeO	55	7	52	22
Bismuth concentrate:				
Gross weight kilograms	35	4,726	587	6
Metal content do	10	1,420	176	3
Cadmium:				
Contained in Tsumeb concentrates [3]	114	99	108	108
Smelter output	------	--------	33	132
Cesium ore, pollucite kilograms	------	--------	--------	1,079
Copper:				
Mine production, content of ore	32,454	35,106	39,423	38,924
Blister	20,778	28,511	29,706	33,032
Germanium: [4]				
In concentrates kilograms	------	--------	--------	--------
In blister copper do	------	--------	--------	--------
Dioxide do	20,348	--------	--------	1,212
Gold troy ounces	3	32	14	--------
Iron ore	15,029	9,481	32,835	37,910
Lead:				
Lead-vanadium concentrate	10,206	9,916	11,476	12,179
Mine production, content of all ores and concentrates	75,496	94,368	87,806	85,044
Refined	1,812	47,795	66,035	75,275
Manganese ore, about 48 percent Mn	------	--------	3,797	23,013
Molybdenite kilograms	486	--------	--------	209
Silver, recoverable, in concentrate [5] thousand troy ounces	1,143	1,436	1,541	1,517
Tantalite-columbite concentrates kilograms	2,069	669	1,005	858
Tin:				
Tin concentrate long tons	265	359	490	718
Tin-tungsten concentrate, about 37 percent Sn and 16 percent WO_3 do	753	659	588	607
Tungsten, scheelite concentrate	------	½ unit	1	1
Vanadium, in lead vanadate concentrate e	1,029	1,000	1,157	1,227
Zinc: Mine production content of ore and concentrate	33,307	32,034	r 29,879	28,242
Nonmetals:				
Aragonite kilograms	------	--------	--------	--------
Diamond:				
Gem e thousand carats	1,076	1,387	1,491	1,583
Industrial e do	119	154	155	176
Total do	1,195	1,541	1,646	1,759
Feldspar	2,232	1,923	2,318	1,197
Fertilizer materials: Phosphatic, guano	1,375	418	1,406	1,833
Fluorspar	435	--------	--------	--------
Graphite	------	250	359	363
Lime	2,923	3,719	3,570	3,123
Lithium minerals:				
Amblygonite, 6 to 8 percent LiO_2	116	12	35	r 27
Lepidolite, 3 to 3.6 percent LiO_2	78	369	270	r 331
Petalite, 3 to 4 percent LiO_2	785	724	1,208	r 853
Marble	925	1,490	1,113	272
Mica	543	377	118	25
Salt thousand tons	65	98	98	63
Semiprecious stones:				
Agate kilograms	------	2,268	5,058	--------
Amazonite do	16,375	9,562	680	--------
Amethyst quartz do	61,253	52,367	2,595	112,128
Chalcedony do	1,016	3,225	7,398	88
Jasper do	181	3,084	360	512
Opal quartz do	------	--------	--------	--------
Rose quartz do	227	13,608	--------	880
Sodalite do	------	6,350	180	--------
Tourmaline do	62	16	2	16
Sillimanite and kyanite	------	572	--------	18
Slate	1,189	642	1,053	195
Wollastonite	------	118	209	336

e Estimate. r Revised.

[1] Chiefly compiled from Minerals, a quarterly information circular of the Department of Mines of the Republic of South Africa, from annual reports of Tsumeb Corp., Ltd. (Tsumeb) and other companies and from Beerman's All Mining Yearbook.

[2] In addition, construction materials such as common clay and sand and gravel presumably are produced, but quantitative data are not available.

[3] For years ended June 30. Data are from company sources and are considerably less than recorded sales and exports, which presumably were derived in part from accumulated ore stocks.

[4] The accuracy of the germanium figures is questionable.

[5] Tsumeb production, for years ended June 30.

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Table 2.—South-West Africa: Exports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Beryllium ore (beryl, 10 to 12 percent BeO)	24	1	All to United Kingdom.
Bismuth concentrate—kilograms	10,076	--	
Cadmium metal:			
Contained in complex concentrate	276	308	United States 261; Belgium 47.
Refined	24	110	United Kingdom 86; Republic of South Africa 10; Belgium 10.
Cesium ore (pollucite)—kilograms	(1)	1,080	NA.
Copper:			
Ore and straight concentrate	679	8,989	Japan 8,474; West Germany 500.
Metal:			
Contained in complex concentrate.	8,021	4,443	Belgium 4,128; United States 315.
Blister	30,150	30,585	United States 19,877; Belgium 7,781; West Germany 2,927.
Germanium dioxide—kilograms	4,591	3,732	United States 2,783; United Kingdom 949.
Gold—troy ounces	31	--	
Lead:			
Lead-vanadium concentrate	9,918	12,484	West Germany 5,920; Netherlands 4,130; Belgium 2,434.
Lead complex concentrates	15,245	85,191	Belgium 67,667; United States 17,524.
Metal: Contained in complex concentrate.	36,723	20,612	Belgium 19,611; United States 1,001.
Lead-zinc sulfide-oxide ore	NA	680	Belgium 679.
Lead-zinc mixed concentrates	NA	4,026	United Kingdom 1,879; Netherlands 1,094; West Germany 1,053.
Refined lead	70,982	68,055	United Kingdom 14,439; Republic of South Africa 11,151; United States 10,815; Italy 9,895; Japan 3,823.
Manganese ore	--	24,718	Netherlands 18,235; France 6,483.
Molybdenite—kilograms	--	209	All to Japan.
Silver metal:			
Contained thousand troy ounce in complex concentrate.	462	484	Belgium 460; United States 24.
Commercial silver—do	198	179	United Kingdom 111; West Germany 68.
Tantalite-columbite—kilograms	755	--	
Tin concentrate—long tons	462	664	All to Republic of South Africa.
Tin-tungsten concentrate	519	630	All to Netherlands.
Zinc:			
Concentrate	15,310	21,072	United Kingdom 9,483; West Germany 7,579; East Germany 2,030; Belgium 1,975.
Metal in complex concentrate	16,891	14,545	United States 12,641; Belgium 1,904.
Nonmetals:			
Diamonds:			
Gem—thousand carats	1,432	1,530	NA.
Industrial—do	158	164	NA.
Total—do	1,590	1,694	
Feldspar	1,432	829	All to Netherlands.
Gemstones, semiprecious:			
Agate—kilograms	907	68	NA.
Amethyst quartz—do	5,173	41,159	NA.
Blue quartz—do	2,721	--	
Chalcedony—do	317	--	
Rose quartz—do	--	34,745	NA.
Sodalite—do	180	--	
Graphite	134	134	All to Republic of South Africa.
Lithium minerals:			
Amblygonite	607	12	All to Japan.
Lepidolite	154	542	Netherlands 285; United Kingdom 257.
Petalite	1,007	1,203	United Kingdom 1,143; Japan 60.
Mica	77	31	West Germany 18; United Kingdom 9.
Salt	49,312	80,526	Republic of South Africa 54,932; Rhodesia 1,666; Congo (Brazzaville) 751.
Sillimanite-kyanite	210	27	All to Netherlands.

• Estimate. r Revised. NA Not available.
[1] Less than ½ of unit.

Sources: Department of Mines, Johannesburg, Republic of South Africa. Quarterly Information Circular Minerals. October–December 1966. South-West Africa Administration, Mines Division. Mineral Statistics, 1966.

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TRADE

Diamond, blister copper and refined lead continued to account for the great bulk of value of the Territory's mineral exports. The following table shows the export values of these commodities in recent years.

Commodity	Export value, million dollars		
	1964	1965	1966
Diamond	84.4	98.4	118.5
Blister copper	19.5	21.0	26.9
Refined lead	10.0	20.7	17.2

With respect to major recipients of exports, destinations for diamond are not reported; however, the United Kingdom generally is by far the largest recipient. In 1966 the four largest takers of the Territory's other mineral exports by value were the United States ($22 million of which blister copper comprised 76 percent); Belgium ($13.2 million for 8 items of which blister copper represented 56 percent and lead-zinc concentrates 39 percent); West Germany ($5.4 million for 13 items of which blister copper comprised 53 percent and lead vanadate concentrates 21 percent); and the Republic of South Africa ($4.6 million for 12 items of which refined lead, tin concentrates, and various grades of salt comprised, respectively, 63, 30, and 6 percent.

With respect to imports, separate statistics for the Territory are not published. The Territory continued to depend on imports for fuels and cement and also for semimanufactures and manufactures of iron and steel and nonferrous metals.

COMMODITY REVIEW

METALS

Tsumeb Corp. Ltd. continued to be by far the largest producer of metalliferous ores in the Territory, and the only metal smelter and refiner. Smelter and refinery production comprised blister copper, refined lead, commercial silver, cadmium, and black arsenic oxide. A plant for germanium recovery was maintained on a standby basis. Zinc concentrates produced are exported, there being no smelting facilities for zinc.

Other important metal miners were The South-West Africa Co. Ltd. (SWAC), and Industrial Minerals Exploration (Pty.) Ltd. (IME), a subsidiary of South Africa Iron and Steel Industrial Corp. Ltd. (ISCOR). SWAC produced lead and zinc concentrates, the Territory's entire output of lead vanadate concentrates, and tin-tungsten concentrates. IME produced tin concentrates.

Besides the companies named, 12 other producers of metalliferous ores were recorded at the end of 1966, mostly significant for output of tantalite, lithium minerals, and copper. There was one producer of manganese ore.

Copper, Lead, Tin, Tungsten, Vanadium, Zinc, and Associated Metals.—*Tsumeb Corp. Ltd.*—During the company fiscal year ended June 30, 1967, metal sales, net profit, and dividends declared were somewhat lower than in the previous fiscal year. Total sales of lead, zinc, silver, and germanium decreased by $9.7 million but larger tonnages of copper and cadmium sold resulted in the sales values of these metals increasing by $4.3 million compared with 1966 values. Average prices for copper, lead, and zinc were lower than in 1966. A comparison of major financial results in fiscal 1966 and 1967 appears below.

	Year ended June 30	
	Thousand dollars	
	1966	1967
Metal sales	78,383	72,984
Net operating income	44,627	41,671
Interest income	916	791
Depreciation and write-offs	4,012	3,721
Provision for South-West Africa income tax	11,931	12,607
Net profit	26,620	28,991
Dividends declared	28,000	25,900

Capital expenditures amounted to $2.8 million, $441,000 less than in 1966. Construction expenditures authorized after June 30, 1967, totaled $3.8 million of which $1.1 million was for surface buildings and equipment and $714,000 for employee housing and welfare.

The corporation reported that on June 30, 1967, it was employing 1,236 Europeans (whites) and 4,859 non-Europeans,

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compared with 1,174 Europeans and 4,771 non-Europeans on June 30, 1966.

Ore reserves as of June 30, 1967, were estimated as follows:

	Thousand metric tons	June 30, 1967 Grade percent		
		Copper	Lead	Zinc
Tsumeb mine:				
Positive ore	986	4.82	10.83	2.88
Tentative ore (34–41 levels)	2,425	4.12	4.94	1.59
Kombat mine:				
Positive ore	1,270	2.66	2.16	XX
Probable ore	1,651	1.58	2.42	XX

XX Not applicable.

In the Tsumeb mine positive ore was recalculated to the 34 level on the basis of additional sampling, with the result that ore grade in parts of the block from the 30 to 34 levels was found lower than previously estimated. Also at Tsumeb, the estimate of tentative ore between the 34 and 41 levels—a distance of 875 feet—was based on preliminary drilling of widely spaced holes. While at yearend the drilling was by no means complete, it had established that a sharp decrease in ore area and metal content occurs in the bottom levels of the mine.

An exploration branch was established in the Corporation's Geological Department and an expanded outside exploration program was begun. At the Matchless mine 10,513 meters of diamond drilling from the surface was completed. Results indicated two copper-bearing bodies in the pyritic zone, estimated to contain about 1 million metric tons, averaging 1.90 percent copper and 12 percent sulfur. At yearend the limits of the occurrence had not been determined. A large acreage in the former Teco concession was abandoned; five selected areas were retained for further exploration.

Table 3.—South-West Africa: Operations of Tsumeb Corp. Ltd.

	Year ending June 30	
	1966	1967
Tsumeb mine and mill:		
Ore mined and milled—metric tons	715,552	720,663
Ore grade:		
Copper—percent	4.24	4.06
Lead—do	12,46	10.25
Zinc—do	3.58	3.26
Silver—grams per metric ton	NA	61.70
Concentrate production:		
Lead concentrate:		
Gross weight—metric tons	141,820	120,888
Metal content:		
Copper—percent	6.82	6.93
Lead—do	56.42	54.03
Silver—grams per ton	105	102
Copper concentrate:		
Gross weight	45,439	48,052
Metal content:		
Copper—percent	40.00	37.07
Lead—do	9.10	8.66
Silver—grams per metric ton	658	565
Zinc concentrate:		
Gross weight—metric tons	20,803	17,755
Metal content:		
Zinc—percent	57.80	56.95
Cadmium—do	1.16	1.25
Mill recovery (in all concentrates):		
Copper—percent of metal in ore milled	91.79	89.46
Lead—do	94.41	94.05
Zinc—do	46.98	43.05
Kombat mine and mill:		
Ore mined and milled:		
Gross weight—metric tons	237,750	312,620
Metal content:		
Copper—percent	1.87	2.51
Lead—do	2.12	1.85
Silver—grams per metric ton	NA	18
Concentrate production:		
Copper concentrate:		
Gross weight—metric tons	10,843	22,810
Metal content:		
Copper—percent	35.75	32.15
Lead—do	5.95	3.82
Silver—grams per metric ton	275	322

See footnotes at end of table.

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Table 3.—South-West Africa: Operations of Tsumeb Corp. Ltd.—Continued

	Year ending June 30	
	1966	1967
Kombat mine and mill—Continued		
Concentrate production—Continued		
Lead concentrate:		
Gross weight, metric tons	6,040	6,997
Metal content:		
Copper, percent	6.47	4.90
Lead, do.	69.01	67.14
Silver, grams per metric ton	75	33
Mill recovery (in all concentrates):		
Copper, percent of metal in ore milled	95.93	97.70
Lead, do.	95.33	96.13
Total ore milled, thousand metric tons	953	1,033
Total concentrate output, do.	225	217
Total recoverable metal content of concentrates produced:		
Copper, metric tons	29,457	32,287
Lead, do.	80,558	70,765
Zinc, do.	9,993	8,403
Cadmium, do.	168	256
Silver, kilograms	47,170	45,093
Smelting and refining:		
Copper concentrates smelted, metric tons	54,542	72,258
Average assays:		
Copper, percent	39.51	35.41
Lead, do.	8.39	7.16
Silver, grams per metric ton	594	476
Blister copper produced, metric tons	-------	34,187
Average assays:		
Copper, percent	98.41	98.76
Silver, grams per metric ton	1,323	1,151
Lead concentrates smelted, metric tons	131,813	130,626
Average assays:		
Copper, percent	6.61	6.91
Lead, do.	56.18	54.40
Silver, grams per metric ton	112	120
Refined lead produced, metric ton	73,873	73,552
Average lead assay, percent	99.998	99.998
Commercial silver produced, kilograms	7,339	6,892
Average silver assay, percent	99.90	99.90
Cadmium plant:		
Blast furnace bag house dust processed, metric tons	3,222	4,821
Refined cadmium produced, kilograms	76,643	165,897
Average cadmium assay, percent	99.987	99.78
Sulfuric acid plant:		
Sulfuric acid produced, metric tons	1,007	1,538
Arsenic plant:		
Bag house dusts processed, do.	NA	9,330
Black arsenic oxide produced, do.	3,253	3,175
Average assay, percent As_2O_3	97.47	NA

NA Not available.

Source: Tsumeb Corp. Ltd. Annual Reports, 1966 and 1967.

The South-West Africa Co. Ltd. (SWAC).—In the fiscal year ended June 30, 1967, ore hoisted from SWAC's Berg Aukas mine totaled 148,660 tons from which 32,577 tons of waste and 3,094 tons of massive sulfides containing 48 percent zinc and 11.3 percent lead were hand-sorted, and 112,990 tons were milled. The tonnage milled yielded 9,834 tons of lead vanadate concentrates averaging 17.8 percent vanadium pentoxide; 5,960 tons of sulfide concentrate averaging 48 percent zinc and 15.3 percent lead; and 19,731 tons of silicate concentrate averaging 48.8 percent zinc and 2 percent lead. The vanadate and massive sulfide tonnages compare with 12,882 tons and 4,191 tons, respectively, produced in the previous fiscal year. The marked drop in this production was accompanied by increased production of zinc silicate concentrates. This situation resulted from the more oxidized nature of ore available for mining in 1967 and depletion of vanadiferous muds in orebodies between the 5 and 8 levels.

On June 30, 1967, Berg Aukas ore reserves were estimated at 1.9 million tons averaging 0.7 percent V_2O_5, 5 percent lead and 24 percent zinc. The comparable figures for the previous fiscal year were 1.4 million tons averaging 0.9 percent V_2O_5, 5 percent lead and 25 percent zinc.

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Two important decisions were taken for Berg Aukas during 1967. It was decided to sink a new shaft from the surface to open up the mine in depth, and in principal a long term contract for sale of Berg Aukas dump residues and zinc silicate concentrates was agreed with Kiln Products Ltd, which would build and operate a Waelz kiln near the mine.

At the Brandberg West open pit mine 451,195 tons of ore were broken in 1967, of which 86,561 tons were milled for a recovery of 641 tons of concentrates, averaging 28.33 percent tin and 24.23 percent tungsten trioxide. Exploratory diamond drilling begun earlier was continued and ore reserves were increased significantly. As of June 30, 1967, reserves were estimated at 2,223,000 tons averaging 0.18 percent combined tin and tungsten trioxide, including 989,000 tons containing 0.22 percent of the metals in the previous ore reserve area.

Other Operations.—During its 1966–67 financial year South African Iron and Steel Corp. Ltd. (ISCOR) organized Imcor (Pty.) to exploit the Rosh Pinah zinc deposit in the Hunz mountains of South-West Africa about 9 kilometers north of the Orange River. The zinc deposit with some lead, contains 3.6 million tons of ore with zinc content estimated at 5.8 percent. An additional 1.5 million tons of ore is indicated. A concentrator will be built near the deposit, with designed daily concentrate capacity of 272 tons for zinc and 23 tons for lead. Production is scheduled to begin in January 1969. The zinc concentrate will be processed in South Africa by Zinc Corporation of South Africa Ltd. (Zincor). The Imcor and Zincor facilities will provide ISCOR for the first time with zinc both mined and processed within the area under South Africa's control.[3]

NONMETALS

Diamond.—Virtually the entire diamond production of the Territory is accounted for by the DeBeers controlled company. The Consolidated Diamond Mines of South-West Africa Ltd. Co. (CDM), and CDM subsidiary companies. At the end of 1967 the direct interest of DeBeers (DeBeers Consolidated Mines Ltd.) in CDM was 97.83 percent. CDM exploits ancient raised diamondiferous sea beaches situated a short distance inland from the present shore line of the Atlantic Ocean, and extending parallel to the shore from the mouth of the Orange River northerly up the coast 100 kilometers or more. The CDM subsidiaries exploit and explore themselves or through CDM the foreshore (strip of beach between high and low tide) and the seabed offshore. At yearend 1967, CDM and its subsidiaries employed 6,251 persons, 509 more than at yearend 1966.

Consolidated Diamond Mines of South-West Africa Co. Ltd.—The following tabulation summarizes CDM operations in CDM's Area No. 1 in 1966 and 1967.

	1966	1967
Overburden stripped thousand cubic meters	15,872	14,197
Gravels mined and screened ---do---	5,175	4,712
Carats recovered thousands	1,504	1,446
Average size of diamonds recovered ---carats---	0.96	0.90
Cost per cubic meter of gravel mined and screened dollars	3.12	3.36
Cost per carat recovered ---do---	10.74	10.94

The decrease in average size of diamond recovered resulted from efforts to mine on the basis of average grade of ore reserves. The increases in cost per carat and cost per cubic meter were due to substantial wage increases.

All 18 field screening plants operated during 1967. Tests on tailings from these plants indicated that losses were occurring, mainly as "locked" diamonds cemented into discarded nodules. A crushing plant was designed to handle such material and was expected to be commissioned in 1968.

The profit of CDM and subsidiaries before provision for tax was $117.8 million in 1967 compared with $111.8 million in 1966. Provision for tax amounted to $41.8 million in 1967 and $43.2 million in 1966. Total dividends declared were $29.3 million (1967) and $33.2 million (1966).

Foreshore Mining.—Between July and December 31, 1967, stripping in the foreshore area totaled 1,140,000 cubic meters and 315,000 cubic meters of material was screened, yielding 64,994 carats. The average stone size was 0.49 carat and costs were $2.79 per cubic meter of gravel screened or $13.54 per carat recovered.

[3] Metal Bulletin (London). No. 5283, Mar. 19, 1968, p. 18.

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Improvement in mining techniques continued, and a successful routine was established for mining the upper half of the beach. Efforts were made to develop techniques for mining the lower half. While mining operations on the beach were profitable in 1967, available reserves were small because mining was limited to the upper part.

Sea Mining.—During the period July 1 to December 31, 1967, operations in sea mining concessions yielded 67,035 carats from 54,993 cubic meters of material processed, at a cost of $70.87 per cubic meter treated or $58.13 per carat recovered. The average size of diamond recovered was 0.40 carat.

A large new mining unit "Pomona" was engaged in determining mining recoveries and improving mining techniques. The prospecting vessel "Rockeater" undertook sampling in Chameis Bay and elsewhere. Construction of a new tug "Chameis" was nearing completion at yearend. At yearend the underwater mining still was not on a profitable basis, and the losses from these operations were exceeding profits earned from the beach.

MINERAL FUELS

Late in the year Southern Oil Exploration Corp. (SOEKOR), owned by the South African Government, and formed to promote oil exploration, established an affiliate, SOEKOR, SWA, in South-West Africa and reportedly received a prospecting license from the SWA Administration. Although earlier some oil prospecting had been undertaken privately, the development was regarded as the start of a formal South African Government-supported effort to find oil in South-West Africa.

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The Mineral Industry of Spain

By Justin B. Gowen [1]

Spain's mineral industry in 1967 continued to expand along with the rest of the country's economy, spurred by new capital investments under the Spanish Economic and Social Development Plan for 1964–67, which included substantial incentive for investment in the minerals and metals industries. Preliminary estimates indicate an average increase of 11 percent in Spain's Gross National Product (GNP) to $23.4 billion at current prices (5.1 percent and $20.8 billion at constant prices).

To compromise some of the serious imbalances in supply and demand, and the resulting deficits in balance of payments, caused by the rapid growth of the economy since 1958, the Spanish Government enacted a number of decree laws covering nearly all phases of the economy. Decrees of special interest to the minerals industries included the following: Order of October 17, 1966, issued by the Ministry of Industry revising the National Steel Program to reflect increased steel consumption estimates for 1968 through 1972 and projecting consumption requirements through the year 1975. Decree of December 23, 1966, issued by the Ministry of Industry establishing minimum sizes and technical requirements to be met by plants in certain industrial sectors for installation benefits.

Decree of March 9, 1967, issued by the Presidency of the Government creating the Empresa Nacional Hullera del Norte, S.A. (National Northern Coal Mine Enterprise, Incorporated) as an Instituto Nacional de Industria (INI) controlled firm.

Decree Law No. 11 of July 27, 1967, granting fiscal incentives to consolidation of Spanish firms and restructuring of Spanish Industry. This decree offers a wide variety of tax exemptions for reorganization through mergers, associations, or the restructuring of individual firms and is designed to rationalize operations by small and/or inefficient companies.

PRODUCTION

During 1967, important gains were shown in the output of aluminum (15 percent), pig iron (24 percent), crude steel (18 percent), zinc (23 percent), cement (11 percent), potash (14 percent), fluorspar (8 percent), and petroleum refinery products (31 percent).

[1] Foreign minerals specialist, Division of International Activities.

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Table 1.—Spain: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966 p	1967 p
Metals:					
Aluminum:					
Bauxite	11,819	6,772	r 4,163	NA	NA
Aluminum	45,488	49,644	r 51,906	60,799	69,761
Aluminum alloys	13,860	21,915	25,067	NA	NA
Antimony:					
Content of antimony concentrate	59	54	86	91	122
Smelter production	853	287	167	NA	NA
Arsenic trioxide	146	143	119	112	129
Bismuth:					
Content of concentrate, kilograms	4,000	------	------	------	------
Smelter production, do	11,719	1,898	140	NA	NA
Cadmium, do	54,100	60,219	r 62,082	NA	NA
Copper:					
Content of ore mined	6,835	r 9,872	r 8,776	1 7,317	1 8,113
Concentrate	13,126	14,739	16,186	NA	NA
Content of concentrate	1,825	2,650	2,897	NA	NA
Content of precipitates	2,976	2,744	r 2,749	NA	NA
Copper sulfate	6,863	4,565	r 6,026	2,134	7,955
Blister [2]	23,513	21,405	r 31,023	18,772	80,291
Refined:					
Electrolytic	43,172	46,710	r 47,029	r 50,681	67,470
Fire refined	6,821	3,254	r 11,683	17,994	4,245
Total	49,993	49,964	r 58,712	r 68,675	71,715
Gold:					
Content of ore mined for gold, troy ounces	15,625	23,534	r 8,295	NA	NA
Metal produced, including byproduct recovery, troy ounces	27,991	27,601	8,874	NA	NA
Iron and steel:					
Iron ore:					
Gross weight, thousand tons	5,193	5,107	r 5,691	5,069	5,085
Iron content, do	2,558	2,529	r 2,764	2,488	2,528
Pig iron, do	1,911	1,903	r 2,338	2,158	2,684
Ferroalloys:					
Ferromanganese and ferrosilico manganese, thousand tons	28	33	38	r 39	42
Ferrosilicon, do	28	16	15	26	22
Other, do	17	17	16	18	16
Total, do	73	66	69	r 83	80
Steel:					
Ingots and castings, do	2,492	3,150	3,516	r 3,897	4,594
Rolled products:					
Railway track material, do	134	118	98	91	82
Heavy sections, do	250	428	556	633	1,495
Light sections, do	285	297	683	770	
Wire rod, do	149	149	431	400	337
Ingots and semimanufacture, for tubes, thousand tons	------	------	63	74	49
Strip, do	118	75	173	169	201
Plates and sheets:					
Heavy, do	301	379	415	367	538
Medium, do	36	41	52	48	
Sheets, hot rolled, do	233	283	271	253	527
Wheels centers and axles, do	15	18	24	18	NA
Other, do	77	91	345	362	NA
Semimanufactures for sale, do	275	386	50	32	NA
Total rolled products, do	1,873	2,265	3,161	3,217	NA
Rough castings, do	36	26	106	95	NA
Rough forgings, do	51	56	136	86	NA
Selected end products:					
Sheets, cold rolled, do	82	100	118	r 379	381
Tin plate, do	59	55	93	r 94	NA
Wire, do	84	56	r 100	117	NA
Lead:					
Content of ore and concentrate	62,194	58,383	r 56,640	62,391	62,623
Refined:					
Primary	62,084	57,994	r 53,815	55,134	52,117
Secondary	NA	4,500	8,790	5,600	6,670
Total	NA	62,494	r 62,565	60,734	58,787

See footnotes at end of table.

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Table 1.—Spain: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966 p	1967 p
Metals—Continued					
Manganese ore	15,293	16,113	r 17,461	19,004	8,385
Mercury:					
Content of ore mined—76-pound flasks	55,617	79,212	r 74,134	69,648	50,416
Metal—do	56,954	78,322	r 74,661	r 70,054	49,227
Silver—thousand troy ounces	4,955	2,315	r 1,961	NA	NA
Tin:					
Content of ore and concentrates—long tons	158	91	r 111	129	113
Refined—do	1,286	1,774	r 1,787	2,957	1,523
Solder—do	610	480	647	364	851
Titanium:					
TiO_2 content of ore and concentrate	24,829	21,478	r 9,982	r 20,958	18,568
TiO_2 produced	6,434	6,615	r 7,274	r 10,390	11,472
Tungsten:					
WO_3 content of ore and concentrate	88	22	42	58	96
Metal	72	38	27	NA	NA
Uranium oxide (U_3O_8) content of ore	------	r 91	116	NA	NA
Zinc:					
Content of ore and concentrate	91,733	88,459	r 39,266	55,029	59,107
Metal:					
Primary	64,730	64,431	r 53,516	55,592	69,664
Secondary	NA	1,500	1,830	2,724	2,430
Total	NA	65,931	r 55,346	58,316	72,094
Nonmetals:					
Barite	48,364	59,133	r 55,465	NA	NA
Cement: hydraulic:					
Natural—thousand tons	595	383	r 337	NA	NA
Portland and other—do	7,153	8,117	9,882	11,807	13,099
Chalk—thousand cubic meters	r 92	91	101	NA	NA
Clays:					
Bentonite	14,169	14,467	17,879	NA	NA
Kaolin—thousand tons	208	141	147	NA	NA
Other—thousand cubic meters	2,186	2,430	NA	NA	NA
Dolomite—do	119	177	143	NA	NA
Feldspar	12,677	16,730	r 25,570	NA	NA
Fertilizers:					
Crude:					
Potash:					
Crude natural salts, gross weight—thousand tons	1,848	2,151	2,643	3,094	3,542
K_2O content—do	300	345	r 431	485	571
Processed or manufactured:					
Nitrogenous (nitrogen content):					
Ammonium sulfate—thousand tons	106	130	r 137	153	221
Calcium-ammonium nitrate—do	67	76	r 92	80	197
Urea—do	2	15	22	31	23
Other—do	2	6	24	NA	NA
Total—do	177	227	275	NA	NA
Phosphatic (P_2O_5 content)—do	326	327	r 351	304	290
Potassic (K_2O content):					
Potassium chloride—do	260	292	r 382	418	506
Potassium sulfate—do	30	36	47	NA	NA
Total—do	290	328	429	NA	NA
Fluorspar:					
Acid grade—thousand tons	104	123	166	167	181
Metallurgical grade—do	49	26	55	57	62
Total—do	153	149	r 221	r 224	243
Gravel—thousand cubic meters	279	691	930	NA	NA
Gypsum—do	1,901	1,405	1,522	NA	Nil
Industrial earths, n.e.s	6,793	8,569	7,317	NA	NA
Lime					
Hydraulic—thousand tons	249	72	104	NA	NA
Quicklime—do	212	r 241	253	NA	NA
Total—do	461	r 313	357	NA	NA
Limestone—thousand cubic meters	11,191	r 12,743	14,305	NA	NA
Magnesite—thousand tons	85	93	101	NA	NA
Marble—thousand cubic meters	52	60	74	NA	NA
Marl—do	2,283	1,786	1,683	NA	NA
Ochre	15,208	20,170	21,243	NA	NA
Pumice	1,529	2,293	56,335	NA	NA
Quartz—thousand tons	73	97	r 146	NA	NA
Quartzite—thousand cubic meters	224	294	171	NA	NA

See footnotes at end of table.

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Table 1.—Spain: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966 p	1967 p
Nonmetals—Continued					
Salt:					
Rock—thousand tons	699	733	r 795	NA	NA
Other—do	999	1,191	r 1,062	NA	NA
Total—do	1,698	1,924	r 1,857	NA	NA
Sand, industrial—thousand cubic meters	607	477	548	NA	NA
Sandstone—do	452	371	514	NA	NA
Sepiolite (meerschaum), saleable	10,940	16,000	10,126	NA	NA
Serpentine—cubic meters	516	1,008	1,304	NA	NA
Silica and silica sand—thousand cubic meters	288	349	275	NA	NA
Slate—do	r 102	43	r 71	NA	NA
Sodium sulfates, natural:					
Glauberite, Na_2SO_4 content	2,517	4,085	6,006	NA	NA
Thenardite, Na_2SO_4 content	33,465	42,486	41,411	NA	NA
Stone, dimension and crushed, n.e.s.[3]—thousand cubic meters	r 1,151	1,011	1,088	NA	NA
Sulfur and pyrites:					
Pyrites, all types:					
Gross weight—thousand tons	2,027	2,393	r 2,424	r 2,418	2,291
Sulfur content—do	r 966	1 135	r 1,149	r 1,132	1,087
Elemental sulfur all types—do	69	77	43	NA	NA
Talc (steatite)	27,503	26,807	r 27,817	NA	NA
Tripoli	10,187	11,346	11,912	NA	NA
Mineral fuels:					
Asphalt, natural	7,800	9,700	13,330	NA	NA
Carbon black	1,300	1,500	1,700	NA	NA
Coal:					
Anthracite—thousand tons	2,773	2,680	2,775	2,747	2,774
Bituminous—do	10,135	9,515	10,168	10,050	9,571
Lignite—do	2,591	2,604	r 2,773	2,632	2,686
Bituminous shale—do	811	712	630	224	NA
Distillation and refinery products					
From coal:					
Coke:					
High temperature (coke oven)—thousand tons	2,752	2,569	r 2,755	2,796	2,885
Low temperature (gas house)—do	199	180	88	71	52
Liquid tar—do	r 121	r 114	r 120	71	93
Naphthaline—do	6	5	4	7	6
Crude benzol—thousand tons	182	170	r 184	194	199
Refinery products:					
Benzine, toluene, xilene, and solvent naphtha	130	126	139	144	150
Other (bitumens, oils, ammonia compounds)—thousand tons	49	37	77	48	36
From bituminous shale:					
Gas oil—do	45	49	52	NA	NA
Solvents—do	38	30	30	NA	NA
Lubricants—do	50	64	r 75	NA	NA
Nonlubricating oils—do	5	5	9	NA	NA
Paraffine—do	3	5	4	NA	NA
Total—do	141	153	140	NA	NA
From petroleum:					
Dry gas—do	88	100	r 128	128	132
Liquid petroleum gases—do	240	326	r 379	424	467
Gasoline—do	1,045	1,217	r 1,471	1,645	2,228
Jet fuel—do	182	160	r 226	232	497
Kerosine—do	351	393	r 319	427	378
Gas oil—do	1,963	2,438	r 2,643	r 3,407	4,425
Diesel oil—do	254	284	r 220	239	334
Fuel oil—do	4,772	5,622	r 6,715	7,770	9,983
Lubricants—do	86	44	r 48	141	159
Nonlubricating oils—do	19	18	r 34	39	26
Asphalt—do	264	331	356	239	196
Other—do	104	238	r 223	526	1,223
Total—do	9,318	11,171	r 12,762	r 15,217	20,048
Gas, manufactured—million cubic meters	400	401	422	463	542
Fuel briquets—thousand tons	1,193	1,054	r 844	r 609	480
Electric energy:					
Hydro—million kilowatt hours	21,139	20,646	19,845	26,470	22,089
Thermal	4,758	8,880	13,571	10,276	17,924
Total	25,897	29,526	33,416	36,746	40,013

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Excludes copper-uranium ores.

[2] Including production from imported ores and concentrates.

[3] Includes basalt, diabase, fonolite, granite, ophite, porphyry, and tuff.

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TRADE

Although final official trade statistics were not available for 1967, preliminary data indicate no significant change in the role of mineral commodities in total trade compared with 1965 and 1966 figures as shown in the following tabulation:

	Value (million dollars)		Minerals commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	152	966	16
1966	150	1.254	12
Imports:			
1965	877	3.003	29
1966	946	3.572	26
Trade balance:			
1965	−725	−2.037	XX
1966	−796	−2.318	XX

XX Not applicable.

Table 2.—Spain: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum and alloys:			
Scrap	94	140	West Germany 86; United Kingdom 29.
Unwrought	808	117	Colombia 100.
Semimanufactures	2,021	3,212	India 1,000; United States 980.
Antimony metal, all forms	50	10	All to the United States.
Bismuth metal, all forms....kilograms	1,814	-------	
Cadmium metal, all forms.....do	9,352	3,705	All to Sweden.
Chromium oxides.....do	2,495	-------	
Copper and alloys:			
Matte	235	74	All to the United Kingdom.
Scrap	195	213	United Kingdom 143; Japan 70.
Unwrought and semimanufactures	14,023	20,254	Netherlands 11,957; West Germany 2,779.
Iron and steel:			
Iron ore, excluding roasted pyrites. thousand tons	1,234	511	United Kingdom 227; West Germany 204.
Roasted pyrites.....do	712	519	West Germany 438.
Oxides	18,426	17,914	United Kingdom 3,598; United States 2,989; Australia 2,201; Italy 1,055.
Pig iron and cast iron. thousand tons	110	90	Japan 30; United Arab Republic 29; Italy 11.
Ferroalloys:			
Ferromanganese.....do	7	8	United States 2.
Other.....do	3	9	United Kingdom 4; West Germany 4.
Steel:			
Primary forms.....do	(1)	24	United Kingdom 18; Netherlands 6.
Semimanufactures:			
Shapes.....do	5	7	United Arab Republic 3; France 1.
Plates and sheets...do	3	6	Argentina 2; France 1; Chile 1.
Other.....do	9	8	France 4; Switzerland 1; United Arab Republic 1.
Lead and alloys:			
Unwrought	317	155	Portugal 122.
Semimanufactures	26	24	Andorra 19; Liberia 4.
Magnesium, scrap	15	20	United States 14; Canada 6.
Mercury:			
Metal.....76-pound flasks	64,781	52,621	West Germany 11,835; United States 7,861; United Kingdom 6,672; Japan 5,163.
Oxides	112	111	Netherlands 59; Sweden 15; West Germany 10.
Molybdenum, all forms.....kilograms	-------	67	Netherlands 66.
Nickel, all forms	15	19	Sweden 14.
Selenium.....kilograms	295	221	All to West Germany.
Silicon	1,046	953	U.S.S.R. 500; West Germany 390.
Tin:			
Scrap.....long tons	113	18	United Kingdom 15; West Germany 3.
Unwrought and semimanufactures. do	r 66	44	United Kingdom 36; Colombia 6.
Titanium:			
Ore and concentrate (ilmenite)	19,108	9,900	All to France.
Oxide	1,795	1,613	United States 944; Brazil 520.
Tungsten:			
Ore and concentrate	246	74	West Germany 37; United Kingdom 17.
Metal, all forms.....kilograms	-------	14,043	Netherlands 13,917.
Uranium ores.....do	25	25	All to Australia.

See footnotes at end of table.

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Table 2.—Spain: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Zinc and alloys:			
Ore and concentrate	6,583	6,157	France 2,585; West Germany 2,509.
Oxides	56	278	Italy 160; Colombia 52.
Unwrought and semimanufactures	10,819	1,965	West Germany 800; Italy 600.
Other:			
Ores and concentrates, n.e.s	r 19,114	13,511	France 13,500.
Nonferrous waste	8,329	337	West Germany 285.
Inorganic bases, n.e.s	r 1,002	222	Sweden 50.
Metals, n.e.s.:			
Scrap	r 32	29	NA.
Ingots and semimanufactures	61	21	NA.
Nonmetals:			
Abrasives:			
Siliceous earths and pumice	803	965	Cuba 419; United Kingdom 330.
Grindstones and whetstones	115	213	West Germany 50; Portugal 33; Chile 29.
Asbestos cement products	1,923	308	Andorra 223; Liberia 27.
Barite and witherite, crude or ground	49,935	49,040	Italy 35,060; United Kingdom 8,899.
Cement, hydraulic	11,392	15,598	Andorra 11,751
Clays, clay products and refractory products, n.e.s.:			
Crude:			
China clay (kaolin), crude or calcined.	25,106	18,512	West Germany 13,950; Netherlands 2,000.
Bentonite	3,247	1,722	France 1,093; West Germany 600.
Other	6,562	11,370	Andorra 5,616; France 2,577; Italy 1,285.
Construction materials:			
Building bricks	7,631	6,035	Andorra 5,402; France 627.
Other nonrefractory	13,395	9,766	Algeria 2,571; France 2,127; Tunisia 1,368.
Refractory construction materials, n.e.s.	3,460	2,025	Cuba 1,003; Algeria 901.
Dolomite, crude, calcined or tarred	2,083	3,655	United Kingdom 3,216; Portugal 439.
Fertilizer materials:			
Natural, animal or vegetable	334	-------	
Manufactured, except ammonia:			
Nitrogenous (ammonium sulfate).	1,497	-------	
Phosphatic:			
Phosphates and superphosphates.	64,897	66,448	Cuba 30,000; Bulgaria 28,143; United Arab Republic 4,805.
Potassic:			
Potassium chloride	395,223	445,151	Norway 81,118; Italy 71,255; Poland 60,840.
Potassium sulfate	7,470	7,450	United States 3,050; Algeria 2,350; Morocco 2,050.
Ammonia	-------	2,711	All to Greece.
Feldspar	31	800	All to France.
Fluorspar	154,569	130,373	United States 100,561; West Germany 22,997.
Gypsum	6,627	3,821	Andorra 2,975; Philippines 370.
Lime, hydraulic	455	493	Andorra 451; France 42.
Magnesite, natural, crude or calcined	30,869	16,047	West Germany 11,459; France 2,424.
Mica products	7	14	Turkey 6; Belgium-Luxembourg 3.
Pigments, mineral	139	623	France 415; Belgium 77.
Pyrites, unroasted thousand tons	1,168	827	West Germany 526; France 125; Denmark 56.
Quartz and quartzite	22,831	23,152	Italy 9,920; Sweden 9,780; Norway 3,495.
Salt thousand tons	404	319	Norway 69; Japan 40; Denmark 39; Iceland 38.
Stone, sand, and gravel:			
Marble and other calcareous	13,073	10,981	Italy 6,532; France 1,807; West Germany 1,727.
Flint, gravel and crushed stone	4,311	-------	
Sand, natural, not mineral-bearing	30,168	18,652	Andorra 18,195.
Slate:			
Crude or rough cut	337	-------	
Slate products	2,945	5,734	France 4,492.
Sulfur, elemental all types	1,200	878	All to Morocco.
Talc and soapstone	1	15	Argentina 3.
Other:			
Meerschaum, amber, and jet	2,624	5,887	France 3,040; United Kingdom 2,806.
Crude nonmetals, n.e.s	1,620	-------	
Mineral fuels:			
Coal, coke and briquets. thousand tons	13	13	Portugal 11.

See footnotes at end of table.

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Table 2.—Spain: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Mineral fuels—Continued			
Petroleum:			
Refinery products:			
Gasoline—thousand tons	297	175	United Kingdom 129; Portugal 35.
Kerosine—do	110	170	India 132; Netherlands 23.
Distillate fuels—do	233	250	Netherlands 90; West Germany 25.
Residual fuel oils—do	905	1,121	Italy 187; United States 138; United Kingdom 93.
Other—do	1	1	NA.
Nonchemical coal and petroleum wastes—do	141	82	Portugal 21; Morocco 15; Congo (Kinshasa) 11.

NA Not available. [1] Less than ½ unit.

Table 3.—Spain: Imports of metals and minerals

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	85,236	77,552	Greece 47,532; Netherlands Antilles 18,027.
Alumina and aluminum hydroxide	115,517	139,423	Guinea 64,190; France 26,153; United States 21,892; British Guyana 21,186.
Metal and alloys:			
Scrap	170	203	Israel 148.
Unwrought	16,897	25,946	Canada 12,673; Norway 8,118; France 2,046.
Semimanufactures	9,032	12,623	France 3,359; Belgium-Luxembourg 2,312.
Antimony:			
Ore and concentrate	708	310	All from Morocco.
Oxides	225	312	United Kingdom 193; Belgium 64; West Germany 40.
Metal, all forms	273	142	United Kingdom 71; Netherlands 45.
Arsenic:			
Anhydrides	1,267	1,055	France 700; Portugal 340.
Metal	5	12	All from Switzerland.
Bismuth	12	10	West Germany 8; Japan 1; United Kingdom 1.
Cadmium: Metal, all forms—kilograms	12,867	21,240	West Germany 17,772.
Chromium:			
Chromite	29,576	29,154	Republic of South Africa 12,779; Turkey 6,179.
Oxides and hydroxide	107	192	West Germany 116; Poland 44.
Metal, all forms—kilograms	7,228	9,401	United Kingdom 6,706; West Germany 2,596.
Cobalt, oxides and hydroxide	70	59	United Kingdom 35; Belgium-Luxembourg 24.
Copper:			
Ore and concentrate	22,865	22,823	Cyprus 12,520; Republic of South Africa 4,164.
Matte	8,815	14,513	Israel 6,953; Cyprus 5,662.
Oxides and hydroxide	142	201	Norway 132; West Germany 67.
Metal and alloys:			
Scrap	17,513	19,683	United States 3,941; Canada 2,752; West Germany 1,848.
Blister and other unrefined	11,652	15,589	West Germany 8,185; Republic of South Africa 3,832.
Refined, unwrought	13,731	23,861	Zambia 7,765; Belgium-Luxembourg 6,878.
Master alloys	70	235	Netherlands 108; United Kingdom 66.
Semimanufactures	18,200	17,383	United Kingdom 7,622; Chile 3,119; Canada 1,521.
Gold and gold alloys:			
Bullion—troy ounces	432,717	515,537	All from Switzerland.
Iron and steel:			
Iron ore and concentrate:			
Iron ore—thousand tons	353	570	Morocco 235; Algeria 122; Brazil 110.
Roasted pyrites—do	5	5	Mainly from Algeria.
Iron oxides and hydroxides	1,608	1,625	West Germany 1,498.
Iron and steel scrap—do	431	383	United Kingdom 117; United States 100.
Pig iron and ferroalloys—do	25	25	West Germany 6; Norway 4; United Kingdom 4.

See footnotes at end of table.

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Table 3.—Spain: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Iron and steel—Continued			
Ingots and other primary forms:			
Coils for rerolling thousand tons	448	577	Netherlands 163; Japan 118; France 101.
Other do	956	616	West Germany 288; Netherlands 70.
Semimanufactures:			
Bars, rods and sections do	143	159	West Germany 56; Belgium-Luxembourg 34.
Plates and sheets:			
Heavy and medium do	191	96	West Germany 55; United Kingdom 15.
Thin:			
Uncoated do	338	176	United Kingdom 49; West Germany 41.
Tinned do	88	75	United Kingdom 25; West Germany 16; France 15.
Other coated do	26	49	United Kingdom 13; Belgium-Luxembourg 13.
Hoop and strip do	18	20	West Germany 7; United Kingdom 5; France 4.
Tubes, pipes, and fittings do	44	58	West Germany 22; France 16; Italy 6.
Other do	16	18	West Germany 6; France 4; Sweden 3.
Lead:			
Ore and concentrate	213	3,768	Algeria 2,961; Morocco 806.
Lead oxides	231	102	Mexico 75.
Metal and alloys:			
Scrap	422	902	Kuwait 728; Australia 50.
Unwrought	23,072	13,820	Peru 4,625; Mexico 3,048; United Kingdom 1,418.
Semimanufactures	731	760	Belgium-Luxembourg 468; West Germany 276.
Lithium hydroxide	43	41	United States 35; West Germany 5.
Magnesium, all forms	313	353	United States 229; Norway 115.
Manganese:			
Ore and concentrate	86,625	142,940	Brazil 37,799; Republic of South Africa 29,936.
Oxides	r 253	662	Netherlands 198; United Kingdom 152.
Metal	150	85	Republic of South Africa 41; France 40.
Molybdenum and alloys, all forms	15	8	Netherlands 4.
Nickel:			
Ore and concentrate	310	-------	
Matte and speiss	441	471	United Kingdom 189; Canada 172.
Metal and alloys:			
Scrap	147	26	United States 10; Netherlands 6.
Unwrought	1,210	1,171	United Kingdom 768; Canada 259; Norway 82.
Semimanufactures	1,129	1,106	United Kingdom 310; France 309.
Phosphorus	51	64	West Germany 45; France 19.
Platinum group metals, all forms thousands	$699	$2,039	France $1,708, Switzerland $183.
Selenium kilograms	7,510	6,489	United States 3,165; West Germany 1,628.
Silicon	81	101	France 70; Norway 31.
Sodium	344	109	France 101.
Silver:			
Unwrought or semimanufactured thousand troy ounces	4,868	6,439	Mexico 3,802; Peru 1,200; Morocco 562.
Rolled silver do	29	35	All to France.
Tantalum metal, all forms kilograms	5	5	All from West Germany.
Tellurium do	1,436	1,434	Canada 952; France 225.
Tin:			
Ore and concentrate long tons	2,398	3,094	Congo (Kinshasa) 809; France 575.
Oxides do	116	159	United Kingdom 93; West Germany 53.
Metal and alloys, all forms do	38	214	Malaysia 147; United Kingdom 46.
Titanium:			
Ore and concentrate (ilmenite)	54	7,451	Australia 6,424; Portugal 980.
Oxides	3,788	5,438	United Kingdom 1,793; West Germany 1,694.
Tungsten:			
Ore and concentrate	191	136	Australia 102; Portugal 24.
Oxides kilograms	2,800	2,200	West Germany 2,100.
Metals and alloys, all forms	8	10	Netherlands 4; West Germany 3.
Vanadium pentoxide	17	13	All from the United States.
Zinc:			
Ore and concentrates	52,993	39,283	Canada 12,523; Greece 6,402; Sweden 5,126.
Dust (blue powder)	94	235	United Kingdom 156; Norway 40.
Scrap	-------	277	United States 199; Denmark 72.
Oxides	165	542	France 276; West Germany 155.

See footnotes at end of table.

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Table 3.—Spain: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Zinc—Continued			
Metal and alloys, all forms	1,042	4,740	France 2,102; Belgium-Luxembourg 576.
Zirconium metal, all forms--kilograms	126	50,991	Australia 50,855.
Other:			
Nonferrous ores and concentrates n.e.s.	r 4,928	7,186	Australia 6,650; United Kingdom 492.
Metalliferous nonferrous waste, n.e.s.	r 14,687	25,730	United States 8,597; Morocco 4,672.
Oxides and hydroxides:			
Bismuth and cadmium	5,651	4,753	Belgium-Luxembourg 3,400; United Kingdom 1,003.
Barium, strontium and magnesium.	740	376	United States 166; France 122.
Base metals and alloys, n.e.s.:			
Pyrophoric alloys	6	12	West Germany 8; Austria 2.
Other rare earth metals and alloys. kilograms	3,331	9,049	France 9,010.
Other	126	227	NA.
Nonmetals:			
Abrasives, natural, crude, n.e.s.	1,876	430	Greece 275.
Asbestos:			
Crude, washed or ground	49,423	75,634	Canada 39,580; Republic of South Africa 20,193.
Asbestos cement products	1,840	1,107	Belgium-Luxembourg 819.
Barite and witherite	415	532	France 180: West Germany 160.
Boron compounds:			
Natural salts	8,947	13,368	United States 8,867; Turkey 4,500.
Oxide and acid	768	670	France 430; Italy 240.
Calcite	23	1,152	Portugal 500; United Kingdom 336.
Cement, hydraulic--thousand tons	2,548	1,559	Rumania 305; Poland 272; Italy 208.
Chalk	2,649	4,341	France 2,903, Belgium-Luxembourg 1,170.
Clays and clay products:			
Crude or washed clays:			
Bentonite	12,507	15,204	Morocco 7,850; United Kingdom 4,369.
China clay (kaolin)	28,404	39,238	United Kingdom 37,766.
Other	23,271	24,606	United Kingdom 11,418; France 6,252.
Construction materials, n.e.s.:			
Refractory bricks and other materials.	25,602	53,853	West Germany 19,788; United Kingdom 7,063.
Nonrefractory bricks and other materials.	20,619	25,179	Italy 12,526; Portugal 7,959.
Cryolite and chiolite, natural	655	1,161	All from Denmark.
Diamond:			
Gem, rough or cut, unmounted value. thousands	$1,275	$1,038	Belgium-Luxembourg $898; Switzerland $45.
Industrial--do	$666	$776	Ireland $276; Belgium-Luxembourg $138
Diatomite and other siliceous earths	1,590	1,821	United States 966; West Germany 490.
Dolomite	937	1,172	Norway 1,137.
Feldspar	1,361	1,206	Portugal 618; France 506.
Fertilizer materials:			
Crude:			
Nitrogenous--thousand tons	122	120	All from Chile.
Phosphatic--do	1,141	1,171	Morocco 850; United States 227; Tunisia 63.
Potassic	-------	150	NA.
Organic, including guano	3,989	5,383	France 5,047.
Manufactured:			
Nitrogenous--thousand tons	728	432	West Germany 170; Norway 99; France 43.
Phosphatic:			
Basic slag--do	32	33	Belgium-Luxembourg 27; France 3.
Other--do	4	15	France 9; Belgium-Luxembourg 5.
Potassic--do	1	1	West Germany 1.
Mixed--do	80	123	West Germany 53; Italy 26; United Kingdom 21.
Ammonia, anhydrous--do	6	15	France 7; Portugal 7.
Gem stones, n.e.s. (except pearls):			
Precious--value, thousands	$29	$303	Belgium-Luxembourg $133; Netherlands $57.
Semiprecious--do	$87	$151	West Germany $109; Switzerland $20.
Industrial--do	$45	$2	Mainly from Switzerland.
Powder and dust, abrasive--do	$117	$81	United Kingdom $32; Ireland $18.
Graphite, natural, crude or ground	801	941	West Germany 301; France 282.
Gypsum	687	1,169	Morocco 1,027; France 71.
Lime	1,227	2,269	United Kingdom 1,001; Portugal 1,000.
Magnesite, natural crude or calcined	11,734	7,212	Austria 2,536; United Kingdom 1,611.

See footnotes at end of table.

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Table 3.—Spain: Imports of metals and minerals—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Mica:			
Crude, powder and splittings	901	565	Norway 174; India 103; United Kingdom 90.
Semimanufactures	24	105	France 95.
Pigments, mineral, including specular hematite.	r 106	165	West Germany 131.
Salt	501	858	United Kingdom 574; Netherlands 276.
Stone, sand and gravel:			
Quartz and quartzite, crude, ground and roughly squared.	674	1,346	West Germany 889; Sweden 188.
Dimension stone:			
Crude, roughly split, and or roughly squared:			
Granite, porphyry, sandstone.	5,949	8,179	Norway 2,327; Portugal 737; Sweden 301.
Marble and other calcareous.	9,784	14,412	Italy 9,103; Portugal 3,660.
Slate	233	667	France 420.
Worked, all types	1,317	1,851	Portugal 1,094; Italy 448.
Gravel and crushed stone, including macadam.	1,010	15,281	France 14,083.
Sand, excluding metal-bearing sand	74,393	67,439	Belgium-Luxembourg 37,635.
Grinding and polishing stones and wheels.	701	975	France 247; West Germany 213; Italy 133.
Sulfur and pyrite:			
Sulfur, elemental, all types	44,858	45,867	West Germany 37,362.
Sulfur dioxide	299	306	Netherlands 184; United Kingdom 102.
Sulfuric acid	77,114	32,570	Italy 32,516.
Talc and soapstone	2,185	2,530	Norway 684; Italy 670; France 655.
Vermiculite and mineral wool	836	540	Switzerland 234; Italy 98.
Other nonmetals:			
Crude, not elsewhere specified	5,445	7,563	Republic of South Africa 2,315; United Kingdom 1,866.
Meerschaum, amber, jet	805	------	
Bromine, fluorine and iodine	190	100	Chile 50; West Germany 50.
Mineral fuels:			
Coal and coke:			
Coal, bituminous and anthracite. thousand tons	1,661	1,386	United States 1,098; Poland 151.
Lignite and briquets do	55	71	All from France.
Peat and briquets do	2	3	United Kingdom 2.
Coke and semicoke do	67	67	West Germany 35; Italy 22.
Asphalt and bitumen, natural	1,029	2,885	Italy 1,920; United States 563.
Carbon black	19,516	25,809	France 14,836; Netherlands 4,255.
Gas, natural	r 240	349	France 259; Belgium-Luxembourg 90.
Other gases (hydrogen and inert gases)	78	90	France 41; West Germany 20; Italy 20.
Petroleum:			
Crude and partly refined. thousand tons	13,396	16,314	Saudi Arabia 6,542; Libya 2,731.
Refinery products:			
Gasoline do	73	63	Netherlands Antilles 48; United Kingdom 13.
Kerosine, white spirit do	93	162	United Kingdom 51; France 34.
Distillate fuels do	42	56	Italy 41; Iran 11.
Residual fuels do	198	205	Italy 83; United Arab Republic 64.
Lubricants do	25	50	United States 27.
Mineral jelly and wax do	6	10	United States 7; West Germany 2.
Nonlubricating oil, n.e.s. do	86	29	Netherlands Antilles 14; Netherlands 6.
Pitch do	44	18	Italy 11; United Kingdom 5.
Pitch coke do	9	19	West Germany 18; France 1.
Petroleum coke do	76	33	United States 27; West Germany 6.
Other coal, gas and petroleum products:			
Mineral tar thousand tons	22	21	United Kingdom 18; Sweden 3.
Coal tar distillation products. do	16	19	Netherlands 7; United Kingdom 3; France 3.
Other do	1	17	Netherlands Antilles 11; France 4.

r Revised. NA Not available.

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COMMODITY REVIEW

METALS

Copper.—During 1967, construction was started on the new copper complex at Huelva. The venture, which will provide facilities for the production of 40,000 tons of electrolytic copper annually, is being financed by Cía. Española de Minas de Rio Tinto (55 percent), The Patiño Mining Corp. (40 percent), and Rio Tinto-Zinc Corp. (5 percent). About 75 percent of the copper ore requirements for the smelter will be imported, and the remainder will be provided by domestic porphyry ores.

Recently discovered reserves of these ores in the Huelva area contain an estimated 30 million tons with 0.8 percent copper, which can be mined by open pit methods.

Table 4.—Spain: Mine production of copper

(Metric tons)

	1964	1965	1966	1967
Copper bearing ores:				
Cupriferous pyrites	480,667	r 375,801	373,926	460,238
Copper content	5,490	r 4,419	4,334	5,045
Porphyry ores	240,909	268,466	242,950	265,934
Copper content	2,770	3,087	2,795	3,058
Other ores:				
Copper	3,345	r 9,582	18,896	13,825
Copper content	49	r 217	188	110
Uranium-copper	33,259	23,994	NA	NA
Copper content	1,563	1,053	NA	NA
Total mine production of ores	758,180	677,843	NA	NA
Copper content	9,872	8,776	NA	NA
Copper concentrates	14,739	16,186	NA	NA
Copper content	2,650	2,897	NA	NA
Copper precipitates [1]	4,313	4,326	NA	NA
Copper content	2,744	2,749	NA	NA

r Revised. NA Not available.
[1] Leached from old dumps and cupriferous pyrites stock piles.

Iron and Steel.—*Iron Ore:* During 1967 domestic output of iron ore remained at about the same level as in 1966 but considerably below the target of 7.4 million tons foreseen in the Development Plan for 1964–67. Included in the decree laws were provisions designed to speed up the consolidation and rationalization of iron ore mining. The decree involved sets minimum annual output limits of 250,000 tons for iron ore beneficiation facilities and 750,000 tons for pelletizing plants to be eligible for financial benefits under the plan. At the same time, output targets for iron ore were revised to 6 million tons for 1970 and 8 million for 1972.

At the yearend most of the large iron ore producers (representing 85 percent of the total output) completed plans for investment in new productive facilities in accordance with the new guide lines. Roughly 70 percent of the Spanish iron ore production came from four areas: Leon (Asturias); Vizcaya (Bilbao); Teruel; and Granada (Andalusia). The remainder was extracted from numerous small mines scattered throughout the country. As of January 1966, estimated reserves of iron ore with an average iron content of 50 percent were reported to be more than 900 million tons. During 1967 Spain had some difficulty in selling its generally low-grade iron ores in competition with richer ores from Africa and North America. The main goal of programs initiated by the Government is to make Spanish ore more competitive with imported ores.

Steel.—The increase in crude steel output was mainly from new facilities. The three major steel producing companies were Ensidesa (Empressa Nacional Siderurgica S.A.), Altos Hornos de Viscaya S.A., and the more recently formed Uninsa (Union Siderurgicas Asturianas, S.A.). The major development was the commissioning of a new 65-ton Linz-Donawitz converter and additional coking and sintering facilities at the Aviles works

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of Ensidesa, increasing plant capacity to 1.6 million tons of crude steel at yearend.

Mercury.—Spanish mercury production has been derived from a number of sources and ore types; however, cinnabar and native mercury ores from the Almaden mine have accounted for much more than 80 percent of total output in recent years as indicated in table 4.

Table 5.—Spain: Production of mercury ores and metal by types of ores

(Metric tons unless otherwise specified)

	1964	1965	1966	1967
Ores:				
Cinnabar and native mercury:				
Almaden mine	63,790	66,243	NA	NA
Mercury content	2,340	2,182	NA	NA
Other mines	7,338	10,017	NA	NA
Mercury content	101	92	NA	NA
Total ores	71,128	r 76,260	76,581	82,554
Mercury content	2,441	2,274	2,127	1,490
Complex ores (mercury arsenic)	75,553	91,264	92,889	93,486
Mercury content	290	282	274	248
Total mercury content of ores	2,731	2,556	2,401	1,738
Metal produced, 76-pound flasks	78,322	r 74,661	70,054	49,227

r Revised. NA Not available.

Table 6.—Spain: Production of pyrites [1]

(Metric tons)

	1964	1965	1966	1967
Cupriferous pyrites	480,667	375,801	373,926	460,238
Sulfur content	226,590	176,425	174,722	217,248
Other pyrites:				
Mine production, direct saleable	1,759,686	1,967,500	2,013,962	1,830,999
Sulfur content	887,281	984,862	954,704	869,677
Concentrates:				
From pyrite ores	51,799	218,296	NA	NA
Sulfur content	24,350	103,700	NA	NA
From lead and zinc ores	101,069	38,829	NA	NA
Sulfur content	47,064	17,484	NA	NA
Total pyrite	2,393,221	2,600,445	NA	NA
Sulfur content of pyrite	1,135,285	1,232,471	NA	NA

NA Not available.

[1] Does not include chalcopyrite-pyrite concentrates derived from porphyry ores and treated by Orkla process to produce copper matte, elemental sulfur, and sulfuric acid. Sulfur content of these ores is estimated to average from 20,000 to 30,000 tons annually.

NONMETALS

Pyrite.—The 1967 decline in pyrite output following the 1966 production of more than 2 million tons was unexplained at the time of this writing. Overall pyrite industry performance in recent years is summarized in table 6.

MINERAL FUELS

Petroleum.—Although Spain is only a small producer of oil, the country's consumption of liquid fuels continued to increase during 1967 and oil's share in the energy balance increased to 40 percent compared with about 35 percent for coal and 25 percent for hydroelectric power during 1967. Imports provided the principal source of crude oil for the Nation's petroleum refineries which had a distillation capacity of almost 520,000 barrels per day at yearend. Plants in operation and under construction at that time were as follows:

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Company	Plant location	Processing units	Crude capacity, barrels per day
On stream:			
Compañia Española de Petroleos, S.A. (CEPSA).	Tarragon	Asphalt	7,500
	Santa Cruz de Tenerife, Canary Islands.	Distillation; reforming-UOP platforming; lube manufacture; asphalt.	160,000
Cía Iberica Rafinadora de Petroleos, S.A.	Bens la Coruna	Distillation; reforming-UOP platforming; cracking-visbreaking;	50,000
Rafineria de Petroleos de Escombreras, S.A. (REPESA).	Escombreras	Distillation; reforming-thermal reforming; lube manufacture.	148,000
Empresa Nacional "Calvo Sotelo" de Combustibles Liquidos y Lubricantes, S.A.	Puertollano	Distillation; reforming-UOP platforming; lube manufacture.	45,350
Esso Petroleos Españioles, S.A.	Castellon de la Plana	Distillation; reforming-Esso powerforming.	66,000
Rio Gulf de Petroleos	Huelva	Distillation; reforming-UOP platforming.	43,000
Total	7 plants on stream		519,850
Under construction:			
Compañia Española de Petroleos, S.A. (CEPSA).	Algeciras	Distillation; reforming-cat reforming; cracking-hydrocracking; coking.	40,000
Esso Petroleos Españioles, S.A.	Castellon de la Plana	Expansion of capacities by 22,000 barrels per day.	22,000
Total			62,000

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The Mineral Industry of Surinam

By F. W. Wessel [1]

The mineral industry of Surinam in 1967 continued to operate substantially at the record pace set in 1966. Bauxite still dominated the field, however as increased hydroelectric power became available, notably less bauxite but more alumina and aluminum were exported. This development had several salutary effects: (1) The value of Surinam's exports increased sharply, and, in conjunction with a modest decline in the value of imports, the trade balance deficit was essentially wiped out; (2) imports of aluminum in 1967 were less than one-fifth of those in 1966; and (3) a smaller amount of outgoing cargo space was needed.

Negotiations for bauxite concessions in the Adampada-Kabalebo area of the Bakhuys Mountains in west central Surinam were continued, but not concluded, nor had plans for hydroelectric development at Avanavero and possibly other sites on the Kabalebo River been activated.

No petroleum production was officailly recorded in 1967, although there were rumors of a trickle of oil from shallow onshore wells north of Paramaribo. Offshore drilling was recessed, but seismic exploration continued. The Royal Dutch Shell group was in possession of the former holdings of Gulf States Land and Industries, Inc.

Gold production continued to decline as a result of increasing costs. Iron ore continued to attract interest, and limited exploration reportedly continued. Bodies of both lateritic and hematitic ore are known. Some consideration was being given to electric smelting of the hematite ores in the vicinity of the proposed Avanavero power development. The distance between the ore deposits and the proposed powerplant site is about 320 kilometers, and the engineering and logistic difficulties probably would be substantial.

Modest production of sand, gravel, stone, and brick clay continued during the year, encouraging the supposition that Surinam may be self-sufficient as to these construction materials for some time into the future.

PRODUCTION

Bauxite was again the major item in Surinam's mineral production. In 1967, the value of bauxite produced for export was $41.4 million,[2] and the value of bauxite processed to alumina in Surinam was an estimated $16.2 million. Alumina and aluminum produced for export again increased in volume and value, the value figures being $38.5 million and $12.8 million, respectively. The bauxite-alumina-aluminum industry continued to be a most significant contributor to Government income, and accounted for more than 80 percent of the entire value of exports.

The value of gold produced in 1967 declined, totaling $183,505. Production data for amblygonite were not available, but production may have dwindled to the disappearing point since N.V. Billiton Mij. relinquished its concession in 1963.

Among the construction materials, crushed stone, stone sand, and gravel were major production items, accounting in about equal parts for 91 percent of the total value of $230,000 for all construction materials. Common sand and brick clay also were produced.

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[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from Surinam florins (S.f.) to U.S. dollars at the rate of S.f. 1.00 equals US$0.535.

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Table 1.—Surinam: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Aluminum:					
Bauxite:					
Crude, dry bauxite equivalent: [1]					
For conversion to alumina	---	---	277,032	e 800,0000	e 1,490,000
For road surfacing and similar uses	70,193	113,372	NA	NA	NA
Processed, for metallurgical chemical, abrasive, and refractory uses:					
Production, all grades, gross weight	3,438,000	3,993,000	4,360,000	4,585,000	NA
Shipments, for export market:					
Dried, gross weight	3,271,815	3,748,773	4,125,466	NA	NA
Calcined, gross weight	210,374	235,465	243,452	NA	NA
Total	3,482,189	3,984,238	4,368,918	[2] 4,584,519	[2] 3,865,895
Dry bauxite equivalent	3,477,800	3,977,300	4,346,200	e 4,570,000	NA
Alumina: [3]					
Shipments, for export market	---	---	59,356	[2] 348,854	[2] 684,567
Delivered to smelter	---	---	12,538	e 51,500	e 62,200
Metal, unwrought [2]	---	---	1,253	25,701	31,097
Columbium-tantalum ore	[4] 2	NA	[5] 7	NA	NA
Gold, troy ounces	3,548	8,258	6,269	5,159	e 4,500
Tin: Cassiterite concentrate, long tons	[4] 2	NA	NA	NA	NA
Nonmetals:					
Clay, common	2,400	4,200	3,300	e 8,000	e 3,800
Lithium minerals: Amblygonite [2]	515	NA	NA	NA	NA
Sand and gravel:					
Common sand	NA	NA	149,748	e r 225,000	e 105,000
Stone sand	7,671	5,725	10,423	9,600	14,850
Gravel	NA	NA	34,034	e r 27,000	e 8,100
Stone, crushed	14,782	9,629	13,807	e 47,000	e 104,700
Mineral fuels: Gas, manufactured [6] million cubic feet	161	170	176	NA	NA

e Estimate. r Revised. NA Not available.

[1] Data for crude bauxite, produced for conversion into dried and calcined products, are not available.

[2] Exports.

[3] Additional quantities may have been produced and stocked or converted into metal stocked at yearend.

[4] Imports from Surinam by the Netherlands. The Netherlands also imported 11 tons of unspecified metallic ores from Surinam in 1963, most of all of which was cassiterite and/or columbite-tantalite.

[5] U.S. imports.

[6] Original data reported in cubic meters; conversion factor used was 35.3145 cubic feet per cubic meter.

Production data were obtained from figures supplied by the United States Consulate General at Paramaribo and by the bauxite companies.

TRADE

The upward trend in Surinam's foreign trade continued during 1966, the latest year for which complete data were available, as the value of exports of commodities of domestic origin rose by $30.7 million; the value of all imports decreased by $5.6 million for a net trade gain of $25.1 million.

Minerals were responsible in 1966 for an additional $28.9 million worth of exports above the 1965 figure, representing 94.1 percent of the total increase. Since the level of bauxite production remained relatively constant, most of the increase came about through exporting higher value alumina and aluminum, rather than the equivalent bauxite of much lower value. The share of mineral products in total exports rose from 80 to 85 percent.

In the face of declining general imports, imports of mineral commodities increased by 46 percent to $24.7 million in 1966. The largest increases took place among the mineral fuels—gasoline, residual fuel oil,

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liquefied petroleum gases, and coke—which increased variously from 20 to 200 percent. Imports of iron and steel semimanufactures decreased by 12.5 percent. Imports of aluminum in all forms decreased by 82 percent; assuming that this difference was supplied by domestic metal entering the market, the operation of the Paranam smelter saved the country $2.95 million in foreign exchange.

Surinam's trade deficit, which averaged $18.5 million annually from 1960 to 1965, dropped to $0.9 million in 1966, mainly because of the increased value of mineral exports.

Comparative values of general trade and mineral commodity trade are shown in the following table:

	Value (million dollars)		Mineral commodities [1] share of (percent)
	Mineral commodities	Total trade	
Exports:			
1964	38.9	48.2	80.7
1965	47.0	59.0	79.7
1966	75.9	89.7	84.6
Imports:			
1964	13.3	81.4	16.3
1965	16.9	96.2	17.6
1966	24.7	90.6	27.3
Trade balance:			
1964	+25.6	−33.2	XX
1965	+30.1	−37.2	XX
1966	+51.2	−.9	XX

XX Not applicable.
[1] Does not include reexports.

Table 2.—Surinam: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Bauxite, all grades	4,368,771	4,578,999	Mainly to United States.
Alumina	59,356	348,854	United States 293,850; Netherlands 55,004.
Metal:			
Unwrought (domestic)	1,253	[1] 25,701	All to United States.
Unwrought (reexports) [2]	11	13	Mainly to Netherlands.
Copper, unwrought (reexports) [2]	86	94	Netherlands 49; United Kingdom 42.
Iron and steel (reexports):			
Unwrought [2]	1,930	1,462	Mainly to United States.
Semimanufactures	1	48	French Guiana 22; Martinique 16.
Lead, unwrought (reexports) [2]	72	52	Mainly to Netherlands.
Metallic ores, slag, ash, not specified	52	1	All to Netherlands.
Nonmetals:			
Cement (reexports)	----------	35	All to Brazil.
Sand, clay, earth	4,523	11,360	Mainly to Netherlands Antilles.
Mineral fuels (reexports):			
Petroleum:			
Crude----------42-gallon barrels	----------	13	Mainly to French Guiana.
Refinery products:			
Gasoline----------do	975	694	Mainly to Netherlands Antilles.
Kerosine----------do	340	296	Do.
Distillate fuel oil----------do	13	88	All to French Guiana.
Lubricating oil----------do	383	318	Mainly to British Guiana.
Liquefied petroleum gas	----------	4	All to British Guiana.
Other----------42-gallon barrels	133	6	All to French Guiana.

[1] Company figure; official figure 2,884 metric tons.
[2] Apparently includes scrap derived from imported metal and metal products.

Source: Algemeen Bureau voor de Statistiek, Suriname (Bureau of Statistics, Surinam). Maandstatistiek van de in-en uitvoer per goederensoort en per land. December (cumulative), 1966.

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Table 3.—Surinam: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Unwrought	31	4	All from Australia.
Semimanufactures	2,066	372	United States 214; Netherlands 57; Switzerland 44.
Copper:			
Unwrought	(1)	10	Mainly from Netherlands.
Semimanufactures	111	88	United Kingsom 40; Netherlands 25.
Iron and steel:			
Unwrought	48	84	Mainly from Netherlands.
Semimanufactures	23,951	20,941	Netherlands 8,911; United States 4,288.
Gold, unwrought, troy ounces	3,537	4,823	All from Netherlands.
Lead:			
Unwrought	3	--	
Semimanufactures	40	32	Mainly from Netherlands.
Magnesium, semimanufactures, kilograms	500	1,800	Mainly from United States.
Mercury, 76-pound flasks	3	9	Netherlands 6; United States 3.
Nickel, semimanufactures	(1)	4	Mainly from United States.
Tin, all forms, long tons	7	10	Mainly from Netherlands.
Zinc, all forms	38	7	Do.
Metallic ores, slag, ash, not further specified	3	--	
Nonmetals:			
Abrasives, natural	1	4	Mainly from Netherlands.
Asbestos and asbestos-cement building materials	1,692	926	United Kingdom 548; Belgium 124; Netherlands 116.
Cement:			
Refractory, net weight	441	560	Mainly from United States.
Other	50,248	40,873	Mainly from Venezuela.
Chalk	231	291	Mainly from Netherlands.
Clay building materials, nonrefractory	929	878	West Germany 305; Netherlands 305: Czechoslovakia 212.
Earths, pigment and siliceous	55	66	Mainly from United States.
Fertilizer materials:			
Nitrogenous	3,288	3,810	Netherlands 2,155; Netherlands Antilles 615.
Phosphatic	59	64	All from Netherlands.
Potassic	18	127	Netherlands 71; West Germany 56.
Not specified	473	501	Netherlands 326; Windward Islands 100.
Total	3,838	4,502	Netherlands 2,615; Netherlands Antilles 615.
Lime	4,726	1,334	Mainly from United Kingdom.
Refractory brick and similar products	1,372	1,304	Mainly from United States.
Salt	r 1,295	1,285	West Germany 897; Netherlands 359.
Sand, clays, earth, not further specified	739	507	Mainly from United States.
Stone:			
Dimension, not worked and worked	5,478	5,704	Mainly from Netherlands Antilles.
Broken stone, gravel, macadam	14,601	38,063	United States 20,470; Netherla ds Antilles 17,148.
Other	161	152	Mainly from Netherlands.
Other [2]	4,368	2,195	Do.

See footnotes at end of table.

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Table 3.—Surinam: Imports of mineral commodities—Continued

Commodity	1965	1966	Principal sources, 1966
Mineral fuels:			
Solid fuels:			
Coal	22	11	Netherlands 7; United States 4.
Other, not specified	7,703	19,623	Mainly from United States.
Gases, liquefied:			
LP-gases	1,475	2,911	Mainly from Trinidad and Tobago.
Manufactured	154	89	United States 68; Netherlands 19.
Petroleum refinery products: [3]			
Gasoline:			
Aviation thousand 42-gallon barrels	19	13	Mainly from Trinidad and Tobago.
Other do.	139	164	Do.
Kerosine do.	44	46	Do.
Distillate fuel oil do.	577	565	Do.
Residual fuel oil do.	996	1,571	Do.
Lubricating oil do.	26	21	Jamaica 10; United States 4.
Paraffin and vaseline	52	78	United States 54; Netherlands 23.
Other thousand 42-gallon barrels	5	2	United States 1; Trinidad and Tobago 1.
Asphalt, natural bitumens, mixtures [4]	1,476	1,322	Mainly from Trinidad and Tobago.
Benzol, toluol, xylol	37	37	Mainly from Netherlands.
Mineral tar, pitch, pitch coke	273	136	United States 70; Netherlands 60.

r Revised.
[1] Less than ½ unit.
[2] Includes some materials not identified by commodity in source and commodities not listed separately in table.
[3] Excluding LPG and petroleum asphalt.
[4] May include some refinery asphalt.
Source: Algemeen Bureau voor de Statistiek, Suriname; (Bureau of Statistics, Surinam). Maandstatistiek van de in-en uitvoer per goederensoort en per land. December (cumulative), 1966.

Table 4.—Bauxite shipments from Surinam

(Metric tons)

Company and destination	1965	1966	1967
Suriname Aluminum Co.:			
United States and Canada	2,645,910	2,866,797	2,018,397
Europe	85,271	89,924	118,751
Others	13,367	16,094	17,100
Total	2,744,548	2,972,815	2,154,248
N.V. Billiton Mij.:			
United States	893,734	1,030,815	1,083,588
Canada	705,856	548,929	618,131
Europe	20,005	31,960	3,048
Others	4,775		6,880
Total	1,624,370	1,611,704	1,711,647
Grand total	4,368,918	4,584,519	3,865,895

COMMODITY REVIEW

METALS

Aluminum.—Apparent production of bauxite in Surinam during 1967 was 5.36 million metric tons, a slight decrease from the record production in 1966 of 5.38 million tons. More of the bauxite was converted to alumina within the country; apparent production of alumina increased from about 400,000 tons in 1966 to 747,000 tons in 1967. Exports of primary aluminum increased 21 percent to 31,097 tons.

Negotiations between the Surinam Government and a number of industrial firms, originally aimed at exploitation of the bauxite resources of the Bakhuys Mountains area, were broadened to include the Kabalebo area of west central Surinam. The three groups conferring with the Surinam Government at the end of 1967 were: (1) A consortium of Suriname Alu-

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minum Co. (Suralco), N.V. Billiton Mij., Aluminum Company of Canada, Ltd., and Ormet Corp.; (2) a joint Kaiser Aluminum & Chemical Corp. - Cie. Pèchiney group; and (3) Reynolds Metals Co. The Government required that the concessionaire contract for a large part of the power to be generated at the proposed Avanavero dam. Industry required adequate and uninterrupted power. Negotiations may have proceeded cautiously because of a border dispute with Guyana. The bauxite deposits lie clearly within Surinam, but the watershed tributary to the dam may be more vulnerable to international disagreement. In March 1967, the Surinam Government retained Arthur D. Little, Inc., to prepare a feasibility study of the Kabalebo area.

Suralco, with the participation of N.V. Billiton Mij., began construction about mid–1967 of its fifth alumina production unit. Completion is expected early in 1968 and will raise total alumina capacity in Surinam to 1 million tons per year.

Suralco continued development of its new mine at Lelysdorp. Alumina shipments to Aluminium Delfzijl N.V. continued; in addition, a new company, Alcoa-Nederland, was formed in the Netherlands, to use Surinam alumina to make "tabular" alumina for refractory and ceramic use. The Brokopondo aluminum smelter operated at about 50 percent capacity during 1967; while the power supply situation was improving, the effects of the drought early in 1966 were still being felt.

Gold.—Gold production in Surinam declined for the third consecutive year. Mijnbouw Mij. Marowijne, N.V., a subsidiary of Gulf States Land and Industries, Inc., and organized to exploit a gold-placer concession in the interior, announced liquidation early in 1967.

Iron.—A recent official release mentions a reserve of 5 billion tons of lateritic iron ore, presumably the total of such deposits northwest, northeast, and southeast of Van Blommestein Lake. Probably not more than one-fourth of this quantity is of an adequate grade to supply potential local reduction furnaces.

MINERAL FUELS

Petroleum.—The Colmar Surinam Oil Co. holds a major offshore drilling concession. This company is owned in equal parts by N.V. Suriname Petroleum Mij. (Petrosur) and the Royal Dutch Shell group. Petrosur in turn represents the interests of three French oil companies. Shell purchased its 50-percent holding from Gulf States Land and Industries, Inc., for about $6.5 million; Gulf States retained a small royalty right.

Under the terms of the concession, Colmar is required to drill six holes by January 31, 1971. Three of these holes, totaling 7,084 meters, were drilled, with only minimal shows of oil. Drilling contractors were Reading and Bates Offshore Drilling Co., who sunk their drill holes from a catamaran-hulled vessel, the "E.W. Thornton." Drilling was recessed early in 1967, and new seismic studies of the 22,000-acre area off Coronie were being conducted.

Royal Dutch Shell also successfully negotiated for onshore concessions in the area abandoned by Colmar in 1965. In the coastal area near Paramaribo, the Surinam Geological Survey is drilling a series of shallow wells to develop fresh water. Since the original discovery of oil in such a well near Calcutta, Saramacca, in 1965, several other wells have found oil at shallow depths, most recently in the southernmost part of the Colmar concession, in possession of the Petrosur-Shell group since September 1967.

Some very minor production from onshore wells was unofficially reported.

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The Mineral Industry of Sweden

By F. L. Klinger [1] and Bernadette Michalski [2]

There was considerable activity in the Swedish mineral industry in 1967 although production levels for the most part showed only modest gains compared with those of 1966. Improvements in productive capacity, production techniques, and the variety of products offered were particularly evident in, but not confined to, the iron ore mining and iron and steel industries. Reduced export prices helped iron ore producers maintain and increase their share of West European markets in the face of competition from non-European producers, while developing improved product grades and new pelletizing capacity. A new low-cost pelletizing technique was brought into commercial production. Strong export demand for steel products countered declining domestic consumption and was primarily responsible for a positive mineral commodity trade balance.

The Boliden mine, an important source of arsenic, copper, and precious metals, was closed in 1967, as were several of the smaller iron mines. New nonferrous metal ores and pyrite mines were brought into production, and additional deposits of iron ore, tungsten, and talc were being explored. There was a major increase in petroleum refining capacity.

Wages increased about 7 percent in most sectors of the industry, and further increases are expected for 1968. Interest rates on commercial loans were reduced following reductions in the central bank discount rate in February and March. The Government instituted a 25-percent tax on nonpriority building construction to reduce inflationary pressures, but construction industry activity still appeared to be substantially higher than in 1966.

PRODUCTION

Except for a sharp increase in petroleum refinery output, and rising production of aluminum, pyrite, and sulfuric acid, output of the major commodities of the mineral industry in 1967 was close to 1966 levels. There were modest increases in iron ore and construction material output; steel production was practically unchanged; and there were declines in mine copper and zinc output. The general performance of the industry in 1967 is reflected in the following indexes:

Industry sector	Index, 1959=100	
	1966	1967
Iron ore mines	154	157
Iron and other metals	187	186
Quarrying, clay, glass, etc	173	179
Total mining and manufacturing	164	168

Source: Statistiska Centralbyran (Stockholm). Allman Månadsstatistik. No. 5, 1968, pp. 320–321.

[1] Physical scientist, Division of International Activities.
[2] Commodity Research Specialist, Division of International Activities.

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Table 1.—Sweden: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Aluminum:					
Electrolytic:					
Unalloyed	17,066	32,286	r 31,714	29,500	34,300
Alloyed	38,942	12,583	1,599	NA	NA
Secondary [1]		38,640	38,943	NA	NA
Semimanufactures [1]	56,800	64,396	56,753	NA	NA
Scrap [1]	4,336	4,020	5,000	NA	NA
Arsenic, white	14,850	17,970	16,500	14,700	20,200
Bismuth [e]	70	68	35	35	30
Cobalt	2	3	1	NA	NA
Copper:					
Ore and concentrate (20 to 24 percent copper:)					
Gross weight	73,906	79,289	r 69,732	r 69,100	e 70,000
Metal content	16,692	16,190	r 15,787	e 14,600	e 14,500
Unrefined (cement)	1,788	970	921	871	NA
Refined	r 45,461	45,652	r 50,548	51,200	47,700
Semimanufactures [1]	148,853	187,697	191,562	NA	NA
Gold:					
Concentrate	59,365	61,340	r 44,214	19,500	NA
Metal content—troy ounces	115,164	117,672	r 118,090	r 77,965	e 115,000
Metal: [1]					
Unwrought—do	167,216	161,107	154,259	[2] 151,108	[2] 117,350
Semimanufactures—do	300,320	413,715	450,303	NA	NA
Iron and steel:					
Iron ore:					
For direct use (60 percent iron)—thousand tons	19,922	22,685	29,485	28,206	28,270
Concentrates (63 to 64 percent iron)—thousand tons	3,715	3,934			
Roasted pyrites—do	267	296	170	133	NA
Agglomerates (sinter and pellets)—thousand tons	3,676	4,323	4,593	5,278	NA
Slag, scale, and other waste—do	329	389	385	NA	NA
Scrap—do	1,422	r 1,555	1,637	NA	NA
Pig iron—do	1,888	2,173	2,287	2,229	2,362
Sponge iron—do	137	152	176	171	152
Ferroalloys—do	133	r 158	r 171	173	151
Steel:					
Ingot:					
Ordinary steel—thousand tons	2,976	3,278	3,432	r 3,452	3,553
Alloy steel—do	692	907	1,004	r 1,029	951
High-carbon steel—do	176	198	224	r 218	215
Castings—do	55	60	64	64	49
Semimanufactures:					
Bars and rods [3]—do	1,087	r 1,195	r 1,265	r 1,240	1,257
Sections—do	155	r 174	192	202	252
Plates and sheets—do	704	r 805	873	963	1,048
Strip, including wide strip—do	300	384	421	r 480	494
Rails and accessories—do	98	69	70	65	43
Seamless tube—do	189	206	235	r 229	204
Forgings—do	92	101	113	129	107
Other, for sale—do	98	127	79	r 40	34
Total semimanufactures—do	2,723	r 3,061	r 3,248	r 3,348	3,439
Lead:					
Ore and concentrate (including silver-bearing):					
Gross weight	102,689	91,948	94,362	96,800	e 102,000
Lead content	71,026	67,470	r 68,950	e 70,500	71,600
Dust, pelletized	1	NA	4,200	5,400	9,300
Refined	r 40,763	r 40,353	r 40,230	43,700	42,000
Semimanufactures [1]	966	1,207	1,486	NA	NA
Oxide	6,704	7,321	6,084	NA	NA
Scrap	736	1,047	1,784	NA	NA
Manganese ore (14 to 17 percent manganese)	7,317	5,944	r 25,949	21,650	e 5,000
Nickel: [4]					
Unwrought	3,039	3,154	2,970	NA	NA
Semimanufactures	2,349	2,579	2,729	NA	NA
Platinum-group metals (semimanufactures) [1]—troy ounces	1,575	1,157	1,093	NA	NA
Selenium	71	82	80	e 82	e 77
Silicon	8,155	7,223	9,296	NA	NA

See footnotes at end of table.

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Table 1.—Sweden: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals—Continued					
Silver:					
Content of concentrate troy ounces	3,580	3,122	3,409	NA	NA
Unwrought [1] do	2,881	[5] 3,226	[5] 4,155	[2] 4,495	[2] 3,707
Semimanufactures [1] do	1,995	2,438	2,859	NA	NA
Tungsten:					
Concentrate:					
Gross weight	339	--	--	NA	NA
Metal content	164	--	--	NA	NA
Unwrought	90	165	50	NA	NA
Uranium oxide [e]	9	9	r 18	r 45	55
Zinc:					
Ore and concentrate:					
Gross weight	147,753	140,176	r 142,368	154,900	e 154,000
Metal content	84,987	77,174	r 79,120	r 86,700	e 86,200
Clinker (70 to 75 percent zinc)	--	14,800	22,800	25,600	29,600
Oxide	3,722	3,510	3,362	NA	NA
Other, n.e.s.:					
Ores and concentrates value, thousands	$186	$178	$380	NA	NA
Ashes and residues, metal bearing	45	22	36	NA	NA
Alkali, alkaline earth, and rare-earth metals	9	9	6	NA	NA
Nonferrous metals [6] value, thousands	$1,793	$2,766	$2,775	NA	NA
Nonmetals:					
Cement:					
Portland cement thousand tons	3,144	3,505	3,649		
Portland clinker do	7	70	162	3,691	3,837
Slag do	125	92	92		
Other do	30	29	34		
Chalk, salable	20,552	17,200	17,686	NA	NA
Clay and clay construction materials:					
Clays:					
Kaolin, including washed kaolin	31,723	44,038	r 41,734	27,300	e 30,000
Refractory	188,381	167,473	r 154,474	154,460	NA
Other ("klinkerlera")	98,118	100,705	47,413	42,371	NA
Construction materials:					
Refractory thousand tons	r 172	185	177	NA	NA
Nonrefractory:					
Bricks and tiles million units	456	467	443	NA	NA
Other thousand tons	r 188	206	203	NA	NA
Corundum (artificial)	441	527	743	NA	NA
Diatomite, calcined	363	217	r 398	500	e 300
Dolomite:					
Crude, for burning	49,007	65,643	68,761		
Burnt	55,766	58,998	63,671	253,600	NA
Other	42,138	40,537	65,491		
Feldspar	45,641	51,777	r 46,946	37,200	e 40,000
Fertilizer materials, manufactured:					
Nitrogenous:					
Ammonia, anhydrous thousand tons	80	95	118	NA	NA
Other do	193	218	209	NA	NA
Phosphatic:					
Thomas slag do	30	51	42	NA	NA
Other do	517	508	508	NA	NA
Other	609	666	710	NA	NA
Flint	60	--	--	NA	NA
Fluorspar	2,951	--	--	--	NA
Lime thousand tons	r 777	r 860	r 878	964	e 900
Limestone, for industrial use do	r 7,957	r 9,065	r 9,468	NA	NA
Mica, ground	20	21	NA	NA	NA
Pyrite:					
Gross weight thousand tons	403	452	441	434	e 440
Sulfur content do	204	231	221	222	e 220
Quartz do	188	r 204	220	NA	NA
Quartzite do	613	823	852	NA	NA
Stone and gravel:					
Building and ornamental stone:					
Unworked:					
Granite, gneiss, etc thousand tons	242	r 254	240	NA	NA
Marble and other calcareous thousand tons	114	r 124	125	NA	NA
Slate do	24	r 15	51	NA	NA
Worked, all types do	231	237	233	NA	NA
Crushed stone, including gravel [7] do	r 6,968	r 8,381	8,703	NA	NA
Sulfur:					
Elemental (recovered from oil shale)	26,300	27,442	21,420	10,000	NA
Sulfuric acid (100 percent) and oleum	474,461	r 523,474	r 578,579	NA	NA

See footnotes at end of table.

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Table 1.—Sweden: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Nonmetals—Continued					
Talc and steatite	18,775	16,659	r 18,723	18,500	e 19,000
Other, n.e.s.	2,571	2,837	10,743	NA	NA
Mineral fuels:					
Bituminous shale (alum shale):					
For distillation—thousand tons	3,098	3,225	1,442	e 805	NA
For fuel—do	175	279	294		
For other use—do	18	24	135	425	NA
Coal—do	99	84	59	r 40	e 20
Coke:					
Coke oven—do	343	375	375	500	e 540
Gashouse—do	570	550	530	545	e 510
Peat:					
Briquets—do	61	41	30	e 40	NA
Baled—do	r 51	r 64	84	e 80	NA
Petroleum:					
Crude (from shale)—do	79	81	58	25	NA
Refinery products:					
Gasoline [8]—do	389	512	503	500	837
Kerosine—do	5	3	3	------	29
Distillate fuel oil—do	640	811	823	835	1,505
Residual fuel oil [8]—do	1,290	1,645	1,769	1,647	2,443
Liquefied hydrocarbon gases—do	37	40	45		
Lubricants—do	163	563		740	902
Bitumen and other—do	409		642		
Total refinery products—do	2,933	3,574	3,785	3,722	5,716

e Estimate. r Revised. NA Not available. p Preliminary.

[1] Including alloys.

[2] Production of Bolidens Gruvaktiebolag.

[3] Including wire rod.

[4] Almost exclusively nickel alloys.

[5] Source: Central Bureau of Statishes (Stockholm). Industri, 1964 and 1965. Figures shown exceed those published by same office in "Bergshantering" by 225 units in 1964 and 272 units in 1965. Reason for difference not identified.

[6] Including scrap.

[7] Not including tarmacadam.

[8] Including production from shale oil through 1966.

TRADE

Preliminary figures indicated that Sweden had a positive trade balance of about $70 million in mineral commodities in 1967, compared with negative balances of more than $400 million in 1965 and 1966. This resulted mainly from increased iron and steel exports and reduced fuel imports. In iron and steel trade, exports exceeded imports quantitatively for the first time in over 10 years, and the gain in value of steel exports together with lower petroleum product imports in 1967 more than compensated for a heavy increase in crude oil imports for the expanding refining industry. A relatively mild winter was also an important factor in reduced fuel demand, and permitted increased exports of petroleum products. Exports of iron ore, Sweden's major mineral export commodity, increased by 800,000 tons compared with that of 1966, but relatively low prices for high-phosphorus ore were probably responsible for a $12 million decline in total value.

In nonferrous metals there were substantial reductions in exports of copper and ores of lead and zinc, but gains in exports of aluminum and lead. Aluminum ore imports nearly doubled while ingot imports declined by 28 percent, reflecting rising primary smelter capacity.

The relationship between mineral commodity trade and total commodity trade is shown in the following tabulation:

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	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	700	3,971	17.6
1966	763	4,270	17.9
1967 p	857	4,528	18.9
Imports:			
1965	1,129	4,376	25.8
1966	1,195	4,571	26.1
1967 p	787	4,703	16.7
Trade balance:			
1965	−429	−405	XX
1966	−432	−301	XX
1967 p	+70	−175	XX

p Preliminary. XX Not applicable.

Sources: Statistical Office of the United Nations (1965–66); Månadsstatistik over Utrikeshandeln (Stockholm), No. 12, 1967, 95 pp.

Table 2.—Sweden: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Bauxite	400	477	West Germany 469.
Scrap [1]	608	731	Denmark 266; West Germany 243.
Ingot [1]	1,792	596	United States 170; West Germany 129.
Semimanufactures	8,343	13,990	Finland 5,373; Norway 4,220; Denmark 2,109.
Copper:			
Ore	-------	9,215	All to Japan.
Scrap	1,429	974	West Germany 630; United Kingdom 120.
Ingot [1]	20,099	34,402	United Kingdom 13,661; France 7,662.
Semimanufactures [1]	36,609	36,213	Denmark 8,932; United States 7,966; Norway 6,318.
Iron and steel:			
Iron ore thousand tons	24,461	22,287	NA.
Roasted pyrite do	424	258	West Germany 154; United Kingdom 91.
Slag, dross, scale, etc do	113	88	Finland 36; United Kingdom 25.
Scrap do	19	19	West Germany 12.
Pig iron, [2] including spiegeleisen. do	99	84	United States 19; West Germany 11; United Kingdom 11.
Ferroalloys do	26	36	United States 12; United Kingdom 11; West Germany 6.
Ingots and other primary forms. do	101	58	Finland 12; West Germany 8; Netherlands 7.
Semimanufactures:			
Bars, rods, sections do	287	279	United Kingdom 48; West Germany 44; United States 42.
Plates and sheets do	306	432	Denmark 86; Norway 82; West Germany 56.
Hoop and strip do	41	47	United States 8; West Germany 6; Norway 3.
Rails and accessories do	30	19	Denmark 12; Norway 4.
Wire do	38	48	United States 8; West Germany 5; France 4.
Tubular products do	160	165	U.S.S.R. 40; West Germany 16; United Kingdom 14.
Castings do	2	2	West Germany 1.
Total semimanufactures. do	864	992	
Lead:			
Ore	41,469	44,849	West Germany 40,023; Belgium-Luxembourg 4,278.
Scrap [1]	161	92	All to Norway.
Unwrought [1]	9,159	10,155	Denmark 6,311; Finland 2,133.
Semimanufactures [1]	26	39	NA.
Magnesium (scrap)	266	202	United States 118.
Manganese, ore	24,888	23,760	Finland 23,123.

See footnotes at end of table.

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Table 2.—Sweden: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Nickel:			
Matte	-------	10	All to the United States.
Scrap	334	371	Belgium-Luxembourg 127; West Germany 87.
Unwrought [1]	72	23	Netherlands 16; West Germany 6.
Semimanufactures	825	1,024	Mainland China 147; Denmark 144; United States 144.
Silver and platinum-group metals: [1]			
Sweepings, scrap residues, etc. value, thousands	$2,144	$2,756	West Germany $1,668; United Kingdom $614.
Silver:			
Unwrought and semimanufactures. do	$1,123	$1,131	Denmark $410; West Germany $300; France $226.
Platinum-group metals. do	$155	$179	Finland $98; Denmark $50.
Tin: [1]			
Scrap long tons	25	12	Norway 11.
Unwrought and semimanufactures. do	159	145	Iran 50.
Tungsten, ore	34	24	West Germany 23.
Uranium and thorium. [1] value, thousands	$65	$193	France $43; Yugoslavia $33.
Zinc:			
Ore	148,608	161,196	Belgium-Luxembourg 62,712; West Germany 46,935; Norway 35,931.
Scrap	1,480	1,414	Belgium-Luxembourg 449; Norway 337; Italy 210.
Unwrought and semimanufactures [1]	204	204	Finland 110.
Other materials, n.e.s.:			
Ores and concentrates	123	174	West Germany 48; Philippines 16.
Nonferrous ashes and residues	68,917	68,119	Norway 27,534; United Kingdom 21,692.
Oxides and hydroxides [2]	2,232	2,344	Finland 549; East Germany 481; Norway 446.
Base metals, including scrap	254	248	United Kingdom 70; West Germany 46 Norway 35.
Nonmetals:			
Abrasives:			
Corundum (natural), pumice, and emery.	60	NA	
Diamond, industrial. value, thousands	$179	$306	West Germany $165; United Kingdom $131.
Grinding stones	1,942	NA	
Asbestos, crude fiber	-------	56	Finland 30.
Cement and asbestos-cement manufactures.	121,859	74,914	West Germany 32,489; Guadeloupe 15,159; Denmark 11,040.
Chalk	3,068	3,363	Finland 2,250; Norway 822.
Clay and clay construction materials:			
Clay (kaolin, bentonite, refractory, and other).	15,631	4,230	Finland 3,006.
Clay construction materials:			
Refractory	24,215	24,396	Norway 8,581; Denmark 7,519; Finland 3,968.
Nonrefractory	31,836	32,549	Norway 9,926; Denmark 6,908; Finland 4,364.
Diamond, non-industrial, unset. value, thousands	$520	$226	Denmark $65; Israel $24; France $17.
Diatomite and other siliceous earths	108	71	NA.
Dolomite, including calcined	3,721	3,986	Denmark 2,311; Norway 952.
Earth pigments	-------	39	NA.
Feldspar (includes fluorspar)	19,955	16,761	United Kingdom 3,936; Belgium-Luxembourg 3,265; Austria 1,600.
Fertilizers, manufactured:			
Nitrogenous	24,859	28,681	India 14,000; Denmark 6,728.
Thomas slag	20,352	20,514	Finland 11,331; West Germany 6,935.
Other	121	1,510	All to Denmark.
Graphite	24	NA	
Gypsum and anhydrite, including calcined.	13	NA	
Limestone, for flux, cement, etc	549,380	NA	
Magnesite, including calcined	205	116	United States 50.
Mica	26	NA	
Pyrite	13,218	41,327	United Kingdom 41,325.
Quartz and quartzite	80,968	86,338	Denmark 49,292; West Germany 22,078.
Salt	1,378	-------	

See footnotes at end of table.

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Table 2.—Sweden: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals—Continued			
Stone, sand and gravel:			
Dimension stone:			
Granite, gneiss	143,511	151,279	West Germany 96,711; Denmark 22,587.
Marble, bluestone, other calcareous stone.	r 559,004	472,684	West Germany 232,392; Finland 188,371.
Slate	596	823	Denmark 407.
Gravel and other crushed stone	588,876	612,994	West Germany 362,973; Denmark 242,449.
Sand	39,342	38,290	Norway 16,156; Denmark 11,580.
Sulfur, crude	201	90	NA.
Talc and steatite	5,080	4,042	Norway 1,334; Netherlands 1,002; Denmark 742.
Miscellaneous materials, n.e.s.:			
Chemical elements	[4] 11,104	[4] 12,302	West Germany 3,931; United Kingdom 2,144; U.S.S.R. 1,555.
Hydrogen and rare gases. value, thousands	$39	$38	Denmark $11.
Inorganic and oxygen compounds of nonmetals or metalloids.	[6] 57,523	[6] 88,775	United Kingdom 28,011; Finland 20,004; Denmark 15,139.
Inorganic bases	[6] 7,161	[6] 9,860	Denmark 2,887; Norway 2,360.
Other mineral materials	1,204	3,530	Denmark 1,379; West Germany 943.
Slag and ash, including kelp	2,375	769	NA.
Mineral fuels:			
Asphalt and bitumen, natural	11,219	17,754	Netherlands 10,851; Spain 2,762.
Coal	2,810	867	Denmark 546; Finland 321.
Coal derivatives	17,015	25,595	Netherlands 11,410; West Germany 6,894.
Coke, including briquets	9,436	7,732	Netherlands 3,154; Denmark 2,291; Norway 1,708.
Peat, including briquets	8,310	11,930	Denmark 6,759; Norway 2,206.
Petroleum refinery products:			
Gasoline	131,071	147,449	Norway 70,009; Denmark 64,847.
Kerosine	7,901	13,568	Norway 12,958.
Distillate fuel oil	69,065	156,053	Norway 77,036; Finland 47,602.
Residual fuel oil	70,462	40,345	Netherlands 32,902.
Lubricants, including greases	45,208	44,973	Finland 15,388; Norway 11,720.
Other, including gases	50,568	46,209	Denmark 31,094; Norway 7,319.
Total	374,275	448,597	
International bunkers:			
Distillate fuel oil. thousand tons	248	NA	
Residual fuel oil do	602	NA	

r Revised. NA Not available.
[1] Including alloys.
[2] Includes cast iron, and shot, grit, sponge, etc. of iron steel.
[3] Includes oxides of lead, zinc, and other metallic oxides comprising Subgroup 513.5 Standard International Trade Classification (S.I.T.C.) (Revised).
[4] Includes silicon, arsenic, selenium, mercury, chlorine, and other elements comprising Subgroup 513.2, S.I.T.C. (Revised).
[5] Includes arsenic trioxide and sulfuric acid.
[6] Includes oxides and hydroxides of aluminum, copper, vanadium, tungsten, and other metals under Subgroup 513.6, S.I.T.C. (Revised).

Table 3.—Sweden: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	22,988	27,200	Greece 18,568; Guyana 8,632.
Oxide and hydroxide [1]	70,954	47,919	Jamaica 43,114; West Germany 4,033.
Scrap [2]		239	United States 64; Rumania 52.
Ingot [2]	27,252	41,110	Norway 20,587; Canada 5,614; United States 4,517.
Semimanufactures [2]	19,015	22,177	Belgium-Luxembourg 4,425; West Germany 3,368; Austria 2,529.
Chromium:			
Ore	141,471	158,784	U.S.S.R. 93,954; Turkey 51,489.
Oxide	1,594	1,528	West Germany 784; France 221; United Kingdom 205.

See footnotes at end of table.

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Table 3.—Sweden: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Cobalt, oxide and hydroxide	6	5	NA.
Copper:			
Ore	76,909	74,939	Canada 39,767; Peru 17,770.
Matte	8,431	9,260	France 8,616.
Scrap	10,400	9,671	United States 4,343.
Unwrought [2]	69,577	58,646	Chile 19,145; Zambia 15,674; Belgium-Luxembourg 12,510.
Semimanufactures [2]	35,294	32,702	Finland 5,467; Belgium 5,136; Chile 3,400.
Iron and steel:			
Iron ore	172,116	214,225	Liberia 212,237.
Pyrite cinder	19,603	5,569	Finland 3,350.
Slag, dross, scale from manufacture of iron or steel.	17,551	23,623	France 16,055; United Kingdom 7,252.
Iron oxide and hydroxide	5,928	6,707	West Germany 5,207.
Scrap	248,268	219,021	U.S.S.R. 94,459; United States 55,417.
Pig iron [3]	341,602	429,945	Finland 241,468; U.S.S.R. 98,602; West Germany 26,187.
Ferroalloys	69,432	72,935	Norway 30,405; U.S.S.R. 12,120; Republic of South Africa 9,291.
Ingots and other primary forms [2].	24,001	12,110	Norway 4,878; Republic of South Africa 2,058; Ireland 2,046.
Semimanufactures: [2]			
Bars, rods, sections	358,760	360,113	West Germany 117,526; Belgium-Luxembourg 67,503; France 67,469.
Universals, plates, sheets	734,318	688,760	United Kingdom 167,481; West Germany 146,264; Netherlands 82,616.
Hoop and strip	65,552	55,861	Belgium-Luxembourg 16,641; West Germany 14,349; Czechoslovakia 8,120.
Rails and accessories	5,025	6,836	West Germany 3,974; Belgium-Luxembourg 1,899.
Wire	17,067	16,577	United Kingdom 7,384; Belgium-Luxembourg 4,469.
Tube, pipe and fittings	204,408	164,906	West Germany 73,674; United Kingdom 22,812; France 18,767.
Castings and forgings, unworked.	5,56[illegible]	4,323	Poland 3,165; Belgium-Luxembourg 313.
Total semimanufactures	1,390,696	1,297,376	
Lead: [2]			
Oxide	2,232	1,721	United Kingdom 906; Poland 320, West Germany 223.
Scrap	666	----------	
Unwrought	7,668	6,963	Peru 3,048; Mexico 1,522; Republic of South Africa 762.
Semimanufactures	2,005	1,858	Belgium-Luxembourg 708; Norway 378.
Magnesium: [2]			
Unwrought, including scrap	478	386	Norway 294.
Semimanufactures	63	95	United Kingdom 44; West Germany 27.
Manganese:			
Ore	95,975	45,956	Republic of South Africa 22,523; U.S.S.R. 22,349.
Oxide	494	1,093	Japan 690; Belgium-Luxembourg 289.
Mercury 76-pound flasks	2,118	2,437	Spain 1,479; Italy 435.
Molybdenum:			
Ore and concentrate	[e] 3,000	[e] 4,000	NA.
Metal, wrought and unwrought	45	72	United Kingdom 18; U.S.S.R. 11; West Germany 11.
Nickel:			
Matte	584	2,313	All from Canada.
Scrap	838	1,297	United States 849; Netherlands 194.
Unwrought [2]	13,184	12,573	Norway 4,837; United Kingdom 4,188.
Semimanufactures [2]	795	951	United Kingdom 582; West Germany 109.
Silver and platinum-group metals:			
Ore and concentrate.	value, thousands	$1,134	$333	Peru $326.
Residues and other waste.	do	$714	$425	United States $198; Denmark $153.
Platinum-group metals	do	$1,533	$3,109	West Germany $848; United Kingdom $794.
Silver:			
Unwrought and semimanufactures.	value, thousands	$3,145	$2,959	United Kingdom $1,348; West Germany $1,181.
Rolled, or other metal.	do	$583	$713	United Kingdom $456; West Germany $254.

See footnotes at end of table.

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Table 3.—Sweden: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Tantalum	1	1	All from Switzerland.
Tin:			
Oxide—long tons	67	34	United Kingdom 18; West Germany 15.
Unwrought, including scrap.[2] do	1,291	770	United Kingdom 473.
Semimanufactures[2] do	104	103	United Kingdom 69; Denmark 17.
Titanium:			
Ore	e3,500	e4,000	NA.
Dioxide	9,803	11,922	Norway 4,131; United Kingdom 1,304; Finland 1,259.
Tungsten:			
Ore	1,881	1,903	Canada 909; South Korea 409; mainland China 386.
Metal	133	152	West Germany 94; U.S.S.R. 20.
Uranium and thorium.[1] value, thousands	$47	NA	
Zinc:			
Ore	496	93	NA.
Oxide	3,509	2,385	Netherlands 1,068; West Germany 643.
Scrap[2]	73	---	
Dust (blue powder)	135	170	Norway 97.
Unwrought[2]	35,783	29,882	Norway 11,916; Poland 7,837.
Semimanufactures[2]	1,540	1,436	West Germany 768; Belgium-Luxembourg 263.
Zirconium ore[4]	e1,554	e1,875	NA.
Other, n.e.s.:			
Nonferrous ores and concentrates.	224	---	
Metalliferous ash and waste	40,018	55,603	Norway 18,646; West Germany 17,168.
Oxides, hydroxides, and peroxides:			
Of strontium, barium, and magnesium.	5,201	4,351	Netherlands 1,959; Norway 1,247.
Other[5]	1,579	1,652	United States 406; Finland 329; Republic of South Africa 233.
Alkali, alkaline earth, and rare-earth metals.	12	8	Austria 4.
Nonferrous metals	2,025	2,621	Republic of South Africa 873; United Kingdom 301; France 271.
Pyrophoric alloys	6	8	West Germany 4; United States 1.
Nonmetals:			
Abrasives:			
Corundum:			
Natural, including emery and pumice.	1,164	1,324	West Germany 544; Italy 390.
Synthetic	e5,762	NA	
Grinding stones	3,727	3,633	United Kingdom 1,590; Austria 595; West Germany 470.
Asbestos:			
Crude	21,162	19,598	Canada 8,526; U.S.S.R. 4,765; Republic of South Africa 1,778.
Asbestos cement products	12,731	7,672	Belgium-Luxembourg 3,339; West Germany 2,720.
Barite, including witherite	1,878	1,480	West Germany 1,241.
Borates, natural	2,458	2,635	United States 2,628.
Boric oxide and boric acid	549	829	France 380; United States 327.
Cement	37,253	46,482	Finland 27,703; Denmark 15,231.
Chalk	10,863	10,190	Denmark 8,000; France 2,014.
Clay and clay products:			
Clay (bentonite, kaolin, refractory and other).	229,371	259,467	United Kingdom 205,400.
Clay construction materials:			
Refractory	90,528	97,898	West Germany 29,189; Austria 26,954.
Nonrefractory	136,992	99,429	Poland 25,484; U.S.S.R. 22,078; Denmark 21,180.
Cryolite and chiolite, natural	1,178	297	All from Denmark.
Diamond and other precious, semiprecious stones:			
Diamond:			
Industrial. value, thousands	$1,260	$1,290	United Kingdom $624; Netherlands $439.
Non industrial, unset. do	$2,238	$1,732	Belgium-Luxembourg $1,266; Netherlands $253.
Dust and powder of gems. do	$291	$429	United Kingdom $310; United States $49.
Other do	$565	$676	West Germany $340; India $62; United States $62.

See footnotes at end of table.

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Table 3.—Sweden: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1996
Nonmetals—Continued			
Diatomite and other siliceous earths	8,773	8,775	Denmark 3,797; Hungary 1,978.
Dolomite, including calcined	27,883	23,147	Norway 21,526.
Earth pigments	258	237	West Germany 91.
Fertilizer materials:			
Crude:			
Phosphate rock	488,457	424,838	Morocco 271,900; U.S.S.R. 65,405.
Sodium nitrate	33,517	26,766	All from Chile.
Manufactured:			
Ammonia, anhydrous	17,614	39,054	Norway 38,770.
Nitrogenous	425,833	470,280	Norway 412,871; Netherlands 49,380.
Phosphatic	669	18,567	Tunisia 17,498; Netherlands 765.
Potassic	194,587	170,108	East Germany 45,009; West Germany 42,546; France 29,467.
Other	34,371	73,041	Norway 23,337; United Kingdom 19,173.
Fluorspar including feldspar	23,799	26,167	France 6,290; mainland China 5,649; Republic of South Africa 5,328.
Graphite	939	1,461	West Germany 497; United States 288; Norway 275.
Gypsum and anhydrite, including plaster.	398,251	361,877	Poland 175,242; France 148,144.
Lime	17,391	13,725	Denmark 10,193; Norway 2,373.
Limestone for flux, cement, etc	88,360	NA	
Magnesite, including calcined	7,998	15,924	Austria 4,946; Netherlands 3,394; United Kingdom 2,886.
Mica, all forms	1,269	1,272	Norway 627; India 271.
Pyrite, unroasted	82,709	124,739	Norway 76,061; U.S.S.R. 45,237.
Quartz and quartzite	22,954	13,479	Spain 9,320; Portugal 1,900.
Salt	752,498	833,044	Netherlands 329,627; West Germany 221,118.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	33,852	27,322	Netherlands 8,418; Finland 6,196; France 4,269.
Caustic potash	1,365	1,274	West Germany 862; United Kingdom 311.
Stone, sand and gravel:			
Dimension stone:			
Granite, gneiss, etc	4,781	2,145	Norway 1,883.
Marble and other calcareous stone.	6,423	3,807	Italy 2,239; Belgium-Luxembourg 919.
Slate	7,546	7,094	Norway 3,978; West Germany 2,587.
Worked, all types	9,418	12,180	Portugal 9,489; Italy 1,302.
Gravel and crushed stone	17,960	22,491	Denmark 12,030; Finland 4,738.
Sand	235,227	205,978	Belgium-Luxembourg 100,850; Denmark 90,308.
Sulfur:			
Crude	159,493	178,380	France 72,406; United States 68,461; Poland 32,246.
Purified	256	658	West Germany 281; Poland 250.
Sulfuric acid, including oleum	22,216	2,423	Norway 2,174; Netherlands 127.
Dioxide	3,265	4,228	Norway 3,126; West Germany 1,099.
Talc and steatite	16,752	18,623	Norway 9,851; Australia 2,189.
Other mineral substances	32,280	28,040	Norway 13,887; West Germany 5,721; United Kingdom 4,438.
Other substances, n.e.s.:			
Chemical elements [6]	2,078	2,337	Norway 2,170.
Hydrogen value, thousands and rare gases.	$261	$211	Norway $141; United States $29; Netherlands $22.
Inorganic acids [7]	10,775	11,789	Norway 6,727; West Germany 1,650.
Mineral fuels:			
Asphalt and bitumen:			
Crude	1,037	1,113	United States 691; Trinidad 384.
Manufactures	2,946	4,323	West Germany 3,780; Finland 372.
Carbon black	22,312	22,596	Netherlands 9,308; United Kingdom 7,005.
Coal, excluding briquets. thousand tons	1,704	1,860	United States 873; Poland 458.
Coal derivatives	36,365	35,563	West Germany 10,879; Netherlands 9,373; Belgium-Luxembourg 4,299.
Coke thousand tons	1,404	1,286	West Germany 652; U.S.S.R. 163; United Kingdom 141.
Lignite and peat, including briquets.	2,685	7,259	All to East Germany.
Petroleum:			
Crude [8] thousand tons	3,824	3,716	Saudi Arabia 781; Algeria 514; Iraq 487.
Refinery products:			
Gasoline do	2,424	2,527	United Kingdom 519; Italy 448; Netherlands 306.

See footnotes at end of table.

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Table 3.—Sweden: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity		1965	1966	Principal sources, 1966
Mineral Fuels—Continued				
Petroleum—Continued				
Refinery products—Continued				
Kerosine, white spirit, etc.	thousand tons	413	476	United Kingdom 216; Netherlands 145; Bahrain 76.
Distillate fuel oil.	thousand tons	6,082	7,478	United Kingdom 1,753; Netherlands 1,526; Venezuela 932.
Residual fuel oil	do	6,206	8,166	U.S.S.R. 3,212; United Kingdom 1,743; Netherlands 595.
Lubricants, including grease.	do	141	136	United States 56; United Kingdom 31; Netherlands 30.
Other, including liquefied gases.	do	87	89	Belgium-Luxembourg 42; France 22; Netherlands Antilles 18.
Total refinery products.	do	15,353	18,872	

e Estimate. r Revised. NA Not available.
1 Excluding artificial corundum.
2 Including alloys.
3 Includes cast iron, spiegeleisen, and sponge, powder, and shot of iron or steel.
4 Includes ores of vanadium and tantalum.
5 Mostly compounds of vanadium, copper, and hydrazine under Subgroup 513.6, S.I.T.C. (revised).
6 Mostly chlorine under Subgroup 513.2, S.I.T.C. (revised).
7 Mostly nitric acid under Subgroup 513.3, S.I.T.C. (revised).
8 Includes partly refined crude as follows: 99,000 tons in 1965 and 162,000 tons in 1966.

COMMODITY REVIEW

TRADE

Aluminum.—Sweden's only primary aluminum producer, AB Svenska Aluminiumkompaniet (SAKO), expanded annual productive capacity of its Sundsvall reduction works to 50,000 tons in 1967, and an additional 10,000 tons was to be installed by the fall of 1968. In a related development, AB Svenska Metallverken (SM) expanded annual rolling-mill capacity at Finspång to 70,000 tons and installed a 10,000-ton-per-year continuous casting machine. SAKO is a subsidiary of SM, of which Alcan Aluminum Ltd. of Canada holds a 22 percent share.

Copper.—Development of the Aitik copper deposit, 16 kilometers southeast of Gällivare, was continued by Bolidens Gruvaktiebolag (BGAB) in 1967. Opencast mining was expected to begin in 1968. Crude ore, containing about 0.5 percent copper, will be concentrated to 28 percent copper at the mine, transported to Koskullskulle by 65-ton trucks, and thence by rail to the Rönnskär smelter and refinery. Known ore reserves at Aitik, reported in 1965 to be 150 million tons, appearently were increased in 1967 when drilling showed that the ore body extends to a depth of 600 meters, twice that previously reported.

BGAB continued to mine copper at Adak under a government lease. Deep-level exploration was in progress in 1967.

Of BGAB's total copper metal output, 23 percent came from company mines in 1967 compared with 19 percent in 1966. The remainder was derived from imported ores. Although mine copper production was expected to rise sharply when mining begins at Aitik, metal production at Rönnskär in 1968 was expected to fall below the levels of the previous 3 years because of plans to reline the copper furnace.

Complex Nonferrous Ores.—Exploration of a State-owned deposit at Stekenjokk, in Västerbotten county near the Norwegian border, was completed by BGAB in 1967 and an economic feasibility study for mining was begun. The deposit reportedly contains about 32 million tons of ore in two ore bodies, averaging 1.6 percent copper, 3.5 percent zinc, 15 percent sulfur, and 40 grams silver per ton.

The well-known Boliden mine, which formed the basis for organization of BGAB,

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was closed in November 1967. During 41 years of operation, the mine produced 8.3 million tons of ore yielding approximately 571,000 tons of arsenic; 117,600 tons of copper; 13 million troy ounces of silver, and 4 million troy ounces of gold in addition to other metals and large quantities of sulfur. The nearby Långdal mine, under development for 3 years to replace the Boliden mine, began regular production in May.

Development of the Näsliden copper-lead-zinc deposit near Kristineberg continued with production expected to begin in 1969. The Näsliden mine is to replace the Rudtjebäcken deposit that will be exhausted by 1972. Also at Kristineberg, development of the Kimheden deposit continued with production expected to start in 1968. Deep-level exploration was also continued at the Kristineberg mine, where the main ore body was found to extend to a depth of at least 700 meters. At the Långsele copper-zinc-lead deposit, a new 660-meter shaft will be sunk.

In central Sweden, limited production was begun by BGAB at the North Garpenberg deposit in 1967. The ore apparently contains important silver values along with copper and zinc. The company acquired the abandoned Stav and Kaveltorp mines in Södermanland County in 1967 and began production at Kaveltorp. Deep-level exploration continued at Saxberget and Ljusnarsberg. At the latter mine, production has been suspended since 1966 to accommodate exploration.

Iron Ore.—Production and exports of iron ore were above 1966 levels, largely because of an average price reduction of 13 percent in 1967 for Swedish phosphoric iron ore. The price cut was made to maintain Sweden's position in West European markets, against increasing competition from producers in Africa, South America, and other sources. In 1966, Swedish iron ore constituted 30 percent of that imported by West Germany and the United Kingdom and 45 percent of that imported by Belgium-Luxembourg; these shares of the market were apparently preserved or increased in 1967. Export shipments and domestic deliveries in 1967 by the two major Swedish producers, Luossavaara-Kiirunavaara AB (LKAB) and Trafikaktiebolaget Grängesberg-Oxelösund (TGO), were as follows:

Destinations	Shipments (thousand metric tons)	
	LKAB [1]	TGO [2]
West Germany:		
Saar	777	645
Ruhr		
United Kingdom	16,853	608
Belgium-Luxembourg		503
Italy	520	NA
France	287	NA
Communist Europe	716	[3] 117
Other	444	49
Total	19,597	1,922
Swedish consumers	633	1,140
Grand total	20,230	3,062

[1] Source: LKAB-tidningen (Stockholm). V. 11, No. 1, 1968, p. 19.
[2] Source: Annual Report for 1967, p. 6.
[3] Czechoslovakia and Poland.

Preliminary data indicate that total 1967 LKAB iron ore production was 21.8 million tons, and TGO output totaled 2.89 million tons, 76 percent from Grängesberg and the remainder from Stråssa. Domestic deliveries by LKAB were mainly to the State steelworks at Luleå, while TGO shipped 660,000 tons to its iron and steel works and 480,000 tons to other Swedish consumers.

Export orders received by LKAB and TGO by yearend indicated that record shipments were likely in 1968. The national level of iron ore stocks increased by 30 percent in 1967, to nearly 8.4 million tons at yearend.

The discovery of two new deep-level bodies of iron ore, similar to that mined at Kiruna, were announced by LKAB in 1967. One, apparently a north extension of the Kiirunavaara ore body, is at a depth of 500 meters and contains an estimated 250 million tons of ore. The other is several kilometers northeast of Kiruna, at a depth of 400 meters; the quantity of ore was not reported but the ore body is up to 200 meters wide.

Because of competitive pressure, at least seven mines (Norberg, Striberg, Bispberg, Kantorp, Stav, Pershyttan, and Haggruvan) were closed or closing by yearend, and the Tuna Hästberg mine will be closed in mid-1968. Total output of direct-shipping ore and concentrate from these mines in 1965 was approximately 700,000 tons. At LKAB's Svappavaara mine, a new 1.1-million-ton-per-year output capac-

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ity concentrator began regular production in January.

TGO completed a second unit at its Stråssa pelletizing plant that raised annual productive capacity to 500,000 tons in 1967. The company also produced 30,000 tons of cold-bonded pellets, in a successful commercial-scale test that led to a decision to build a 600,000-ton-per-year plant. The cost of this plant, to be completed in 1969, was expected to be one-third that of a conventional pelletizing plant because the firing step is eliminated. The pellets are bonded with cement clinker. In northern Sweden, LKAB was operating a new horizontal traveling bed pelletizing plant at Kiruna (1.5 million tons annually) and an expanded shaft furnace facility at Malmberget (1.1 million tons annually). Early in 1967 the company contracted with Allis-Chambers Manufacturing Co. of Milwaukee, Wis. for construction of a pelletizing plant at the Svappavaara mine by 1969. The plant will employ the inclined grate-kiln process and will have an annual capacity of 1.8 million tons of pellets.

Additional grades of ore were produced during the year by new screening plants at Kiruna (ore fines) and at Grängesberg (lump ore). Three classes of lump ore are now produced by TGO.

Iron and Steel.—The increase in iron and steel production in 1967 was due mainly to reduced imports and a heavy increase in export demand. Sweden's apparent consumption of steel declined to 3.3 million tons (3.5 million tons in 1966), mainly because of reduced requirements in the mechanical engineering industry but also in construction, where increased residential building did not compensate for decreased industrial construction. Iron and steel prices on the domestic market were reportedly the lowest in Europe.

Net 1967 finished steel exports amounted to 115,000 tons valued at over $200 million. Total steel exports were 1,277,000 tons, with special steels constituting 27 percent of the tonnage and 63 percent of the value. In contrast, ordinary steel constituted 85 percent of the volume and 76 percent of the value of steel imports. The contrast in type of steel traded was similar to that in previous years, but the excess in volume of exports over imports was unusual.

Iron- and steel-making capacity of Swedish plants at yearend 1967 is indicated by the following tabulation:

	Number of units	Annual capacity (thousand metric tons)
For pig iron:		
Blast furnaces	15	2,545
Electric furnaces	5	162
Hot blast cupola	1	65
Total	21	2,772
Effective capacity	XX	2,692
For sponge iron	9	215
For steel:		
Bessemer converters	1	10
Thomas converters	3	160
Acid open-hearth	17	516
Basic open-hearth	18	1,072
Electric (arc)	67	1,910
Electric (induction)	36	219
Oxygen (Linz-Donawitz and Kaldo)	8	1,799
Total	150	5,686
Effective capacity	XX	5,426

XX Not applicable.

Source: Järnverksföreningen (Stockholm). Svensk Järnstatistik, No. 1, 1968.

Total research expenditure by Sweden's steel industry in 1966 was estimated at about $12 million or 1.35 percent of total sales value, compared with an average of 1 percent reported for other West European countries.

Iron.—Pig iron output by TGO in 1967 included 717,000 tons at Oxelösund and 56,000 tons at Guldsmedshyttan. Also, 25,000 tons of sponge iron was produced at Oxelösund.

Höganäs AB (formerly Höganäs-Billesholms a.-b.), the leading world iron powder producer, was increasing production facilities for this commodity in Sweden and in its large manufacturing subsidiary at Riverton, N.J. Total iron and steel powder deliveries by Höganäs exceeded 90,000 tons in 1966 and 1967, and annual capacity was expected to increase by at least 40,000 tons in 1969. Allmänna Svenska Elektriska Aktiebolaget (ASEA) was developing high-pressure cold-forging presses to manufacture machinery parts from powdered metal.

Steel.—At Oxelösund, TGO produced 713,000 tons of crude steel in 1967, two-thirds by the oxygen process in Kaldo converters. The company planned to install two new Kaldo units instead of

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the 120-ton Linz-Donawitz converter originally planned for 1968; this will increase the annual capacity of the Kaldo plant to 900,000 tons, and the total ingot-steel capacity at Oxelösund to about 1.1 million tons. Also during 1967, a 400,000-ton-per-year Concast plant for steel slabs began operation in September. Output of heavy and medium plate was 470,000 tons and capacity was to be increased to 550,000 tons annually.

At Luleå, Norrbottens Järnverk AB apparently resolved most of the production problems associated with its hot strip mill and the company reported an operating profit by mid-1967. The State-owned works has an annual production capacity of about 500,000 tons of finished steel, and its fabricating division may be Europe's largest producer of ship profiles and frames.

Special Steels.—Production of special steels in 1967 is shown in the following tabulation:

Type of steel	Thousand tons	
	1966	1967
High carbon, unalloyed	217.8	215.0
Stainless	289.8	303.0
Heat-treatable, case hardening, etc.	264.0	190.8
Tool	91.7	76.8
High-speed	16.2	16.1
Free-machining	10.7	8.2
Other, including bearing	356.6	359.8
Total	1,246.8	[1] 1,169.7

[1] Differs slightly from total indicated in table 1. Reason unidentified.

Source: Järnverksföreningen (Stockholm). Svensk Järnstatistik, No. 1, 1968.

In 1967, Avesta Jernverks AB installed the first of three replaceable electric-arc furnace shells; these were expected to increase stainless steel output by 10 to 15 percent by reducing down-time for furnace relining from 40 hours to 6 hours.

The Sandviken Company established a new alloy and high-speed steel research center in 1967 and was investing about $5.6 million in a new plant for production of long tubes, drawn wire, and stainless steel plate.

At TGO's Nyby works, a Sendzimir cold rolling mill for stainless steel sheets to be installed by yearend 1969, will increase the division's annual capacity for sheets 0.3 to 3 millimeters thick and up to 1 meter wide from 17,000 to 40,000 tons. A controlled-pressure pouring plant with a production capacity of 24,000 tons annually was installed in 1967 and a second plant is to be added by 1970.

Uddeholms AB centralized stainless steel plate and high-speed steel production at its Degerfors plant, and in an agreement with Fagersta Bruks AB, Uddeholms took over Fagersta's production of stainless steel and sold its alloy business to Fagersta.

Orders from the Soviet Union for high-tensile welded steel line pipe made by TGO's Hedlund division continued in 1967 for the eighth consecutive year. The division delivered 52,000 tons of heavy gage pipe in 1967, 40,000 tons destined for the Soviet Union and 12,000 tons to the British Gas Council for North Sea pipelines. Increased deliveries to the Soviet Union are expected in 1968.

Output of special steels by AB Svenska Kullagerfabriken (SKF) during the first half of 1967 was slightly less than in the corresponding period in 1966. In the latter year the company produced 440,000 tons of ingots at the Hofors and Hellefors plants and delivered nearly 257,000 tons of finished products to SKF factories at home and abroad. Production of special steel by the SKF–ASEA degassing process was being increased at Hellefors, and the process was also installed by the Fagersta and Bofors companies.

Lead.—BGAB continued as Sweden's only refined lead producer. The entire output was derived from concentrates from company mines in northern Sweden; lead concentrates produced in central Sweden were exported. Most of the production from Laisvall, the country's principal lead mine, has been obtained from the Kautsky ore body where development was completed in 1966. Development of the Bellviksberg opencast lead mine, at Tasjö near Dorotea, was postponed because of lower lead prices; the mine had been scheduled for production in 1969.

Tungsten.—A scheelite deposit containing 1 percent tungsten was reportedly being explored by a group of six Swedish steel companies at Elgfält, near Kopparberg, in 1967.

A continuous sintering furnace for production of tungsten carbide was placed in operation by Fagersta Bruks AB in March. The furnace reportedly has 8 times the capacity of a conventional vacuum furnace and was built by Vacuum Indus-

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tries Inc. of the United States. The Fagersta Co. plans to install additional units.

Uranium.—Uranium extraction from shale at Ranstad by AB Atomenergi was continued at less than half of plant capacity in 1967. The reduced operations level was being maintained in order to concentrate on reducing extraction cost, which in 1967 was higher than world uranium prices.

NONMETALS

Cement and Other Construction materials.—Construction industry activity increased in 1967, stimulated by easing of interest rates and the unusually mild winter. The number of building starts and completions was 6 to 12 percent higher than in 1966 but output of cement, glass and other construction materials increased only 3 to 4 percent.

Skanska Cement AB, which accounted for about 80 percent of Sweden's cement output in 1965 and 1966, was completing new installations at Limhamn to increase the works' annual capacity from 700,000 to 1.2 million tons. New quarry installations and a 2-kilometer conveyor tunnel were completed at midyear and a new rotary kiln went into operation in September. The highly automated Limhamn works will be Sweden's largest cement plant.

Göteborgs Makadam AB, the largest road and concrete aggregate producer in the Gothenburg area, began operating a new semiautomatically controlled plant at Vikan with an annual capacity of more than 1 million tons of crushed granite, to serve markets north of the city. A second plant of similar capacity was operated at Kallered, several kilometers south.

Pyrite and Sulfur.—BGAB produced 447,600 tons of sulfuric acid in 1967, mostly from domestically mined pyrite, about 95,000 tons more than in 1966. Two-thirds of the total was produced by the Reymersholm division (formerly Reymersholms Gamla Industri AB, which was merged with BGAB in October 1966), and the remainder by the Rönnskär smelter. A new plant under construction at the Reymersholm Works in Hälsingborg, with an annual capacity of 250,000 tons, expected to be completed in late 1969, will increase BGAB's total annual sulfuric acid capacity to more than 700,000 tons. Parallel with this development, pyrite deposits of the Kedträsk field, 30 kilometers from Boliden, are being prepared for production and concentrator capacity is being increased. Exploration of the Kedträsk deposits had been resumed in 1966, and opencast pyrite mines were opened in the same region at Kankberg and Rakkejaur. Production from Kankberg apparently continued through 1967 but ore-dressing problems may have delayed operations at Rakkejaur. Ore from these mines was processed at the Kristineberg and Boliden concentrators in 1966.

Elemental sulfur recovery from oil shale probably ceased in 1966, as shale oil production by the Government was being discontinued at Kvarntorp, where output totaled 25,000 to 30,000 tons annually until 1965. The loss of this source apparently was compensated by increased production and imports of pyrite.

Stora Kopparbergs Bergslags AB was installing a 170-ton-per-day Lurgi pyrite roasting unit at Falun in 1967; completion is scheduled for early 1968.

Talc and Steatite.—A steatite deposit was being investigated in the Lautakoski area near the Finnish border by the Swedish Geological Survey. The mineralized zone was reportedly at least 600 meters long, 200 meters wide, and 20 meters deep.

MINERAL FUELS

Coal and Coke.—Swedish coal output, which has been rapidly declining in recent years, was probably limited to that produced as a clay byproduct in 1967. The Nyvång coal mine, operated by Höganäs-Billesholms AB, was closed in May 1966.

Coal imports in 1967 declined to 1,678,000 tons, with the United States supplying 46 percent of the total. Imports from Poland, the United States, and the United Kingdom declined, while shipments from the Soviet Union and West Germany increased; the latter, 249,000 tons, appeared to be stimulated by further price reductions, with the average value of coal imported from West Germany in 1967 at $14.71 per ton compared with $16.16 in 1965.

Coke imports declined by 273,000 tons in 1967. Metallurgical coke output at Oxelösund was 483,000 tons, most of Sweden's national output.

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Coal and coke consumption in recent years was as follows:

Commodity and consumer sector	Thousand metric tons	
	1965	1966
Coal:		
Gas works	664	690
Coke ovens	479	625
Industry	[1] 559	[1] 400
Transportation	14	15
Other	138	120
Total	1,854	1,850
Coke-oven coke:		
Iron and steel industry	[2] 1,235	[2] 1,170
Other industry	250	250
Transportation	10	10
Other	340	350
Total	1,835	1,780
Gas coke:		
Industry	268	255
Gas works	98	90
Other	186	200
Total	552	545

[1] Includes 50,000 tons consumed by iron and steel industry exclusive of coking plants.
[2] Includes about 500,000 tons transformed into blast furnace gas.

Source: Organization for Economic Cooperation and Development. (Paris). Statistics of Energy 1952–1966. 1968, pp. 242–245.

Petroleum.—There appeared to be little activity in oil and gas exploration in Sweden, either onshore or in Continental Shelf areas. Basic offshore legislation was passed in mid-1966 but no concession applications were reported by yearend 1967. Future exploration activity was expected to be controlled by the Swedish consortium composed of LKAB, the Oljekonsumenterna (OK) cooperative, and the Axel Johnson Group, but it was possible that European and/or U.S. companies would be permitted to participate. Offshore boundary agreements between Sweden and neighboring states had not yet been made, although negotiations with Finland were underway and agreement appeared to be close on the geographical point at which offshore boundaries of Sweden, Norway and Denmark should meet. Complete formal definition of Sweden's offshore boundaries will also require agreements with the Soviet Union, Poland, and probably East Germany, although the latter country is not recognized by Sweden.

Crude oil imports in 1967 increased by 2.4 million tons as compared with 1966 figures, as new refining capacity went into operation. A similar rise in imports was expected in 1968.

Refinery capacity at Gothenburg increased by at least 6 million tons annually in 1967. AB Svenska Shell nearly doubled capacity of the Koppartrans refinery, to about 4 million tons annually, and Svenska BP completed the Syrhaala refinery (annual capacity 4 to 5 million tons). Total annual refining capacity in Sweden was about 10 million tons by yearend, but it continued to be less than half of the domestic demand for petroleum products. This gap reportedly was the result of company reluctance to build additional refineries to meet the Swedish market's heavy demand for heating and fuel oils relative to that for other refinery products. These oils usually account for about 70 percent of Sweden's petroleum product consumption.

An unusually mild winter and increased hydroelectric power availability in 1967 led to a decline in heating and fuel oil consumption, the first in several years. The effect on total consumption is shown in the following tabulation:

Product	Thousand metric tons	
	1966	1967
Gasoline	2,374	2,454
Kerosine	269	228
Gas/diesel oil	7,085	6,861
Residual fuel oil	9,055	8,403
Other	1,190	1,221
Total	19,973	19,167

Source: Organization of Economic Cooperation and Development (Paris). Provisional Oil Statistics by Quarters—4th Quarter 1967. 21 pp.

Atomic Energy.—Construction of the Marviken and Oskarshamn nuclear powerplants continued. The 140-megawatt Marviken plant was scheduled for completion in 1968 while the 400-megawatt Oskarshamn plant was scheduled for completion in 1970. Fuel elements for Marviken are being manufactured by AB Atomenergi. For the Oskarshamn reactor, uranium from Sweden will be enriched in the United States under a contract negotiated in mid-1967 by Oskarshamnverkets Kraftgrupp AB with the U.S. Atomic Energy Commission (USAEC). The contract calls for USAEC to supply 10,000 kilograms of enriched uranium annually for 30 years. A second contract between the same parties provides for direct sales of enriched uranium to the Oskarshamn Company to cover needs through 1968.

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The Mineral Industry of the Syrian Arab Republic

By John R. Lewis [1]

During 1967, Syria's economy faltered under several adverse pressures, and the mineral industry, never a major factor in the agriculturally oriented nation, was noticeably influenced.

A dispute with the Iraq Petroleum Company (IPC) over transit charges for oil crossing Syria, and over payment of back taxes, resulted in Syria's seizure, in late 1966, of IPC pipelines and other facilities in the country, and the shutdown of the pipeline. Resumption of the flow of oil (and of the adjusted transit fees) had barely begun to return to normal when the Arab-Israeli war prompted an embargo of crude oil destined for Western customers, closing both the Trans-Arabian Pipeline (Tapline) and the IPC pipeline, and completely drying up one of Syria's major sources of governmental income. Subsequent reopenings and increased throughput served as steadying influences to the economy. Prior to these shutdowns, Syria received from these lines about $28 million annually from 1964 to 1966. As a result of the increases in transit fees and throughput, it is anticipated that revenues will rise to about $42 million annually.

The widening rift between Syria and Western nations has created a dearth of production and trade information, but all signs point to rather severe economic stagnation, with production apparently continuing downward during 1967.

Although the Government moved toward greater nationalism, substantial material assistance from similarly inclined nations did not appear to be forthcoming.

The United States Agency for International Development (AID) in October 1967 estimated Syria's 1965 gross national product (GNP) at $1,125 million,[2] with a per capita GNP of $210, somewhat higher than in previous years. No more recent data are available. Syria's labor force is estimated to be about 40 percent of her 5.9 million total population, and about 7,000 persons work in mineral-based industries.

Exports of metals, nonmetals, and mineral fuels were valued at approximately $991,000 in 1966, while imports totaled about $66 million.

Syria's second 5-year plan was released in March 1965 covering 1965–69. The principal sectors of development (irrigation and land development, agriculture, industry, mining and fuel, transport and communications, and public services) were only broadly outlined. Eight projects were essentially those listed in the first 5-year development plan and were still, for the most part, in the design stage.

The rather sizable Euphrates River hydroelectric installation, near Tabqa in north-central Syria and in planning for a number of years, moved forward during 1966 and 1967 at an accelerated pace. In April 1966, the U.S.S.R. agreed to provide materials and manpower, to assist in the construction, and to lend a goodly portion of the necessary money for the installation. Initial engineering surveys were to be completed late in 1967. The project, scheduled for completion in 1970–71, is expected to about double Syria's irrigated lands and provide a huge source of electric power. At the outset it will be capable of 300,000 kilowatts of electricity and later it will generate 800,000 kilowatts. Syria's agreement of several years' standing with the Federal Republic of Germany regarding

[1] Petroleum engineer, Division of International Activities.

[2] Where necessary, values have been converted from the Syrian pound (S£) at the rate of S£3.82=U.S. $1.00. Currency fluctuations of 10 to 20 percent, however, are prevalent.

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the dam was terminated during the period. Largest of the projects in the 5-year plan, the dam will take $171 million or about 13.1 percent of the total 5-year budget. Many problems remained to be solved, including that of the water rights exercised by the several countries through which the Euphrates River flows.

A long-standing discussion between Syria and the Iraq Pipeline Company over transit fees, terminal charges, and certain taxes, resulted in seizure of the company's facilities by the Syrian Government in December 1966. Included were 700 kilometers of pipeline and terminal facilities at the Mediterranean port of Baniyas. A 2½-month shutdown ensued. Iraq's crude oil customers were served through alternate facilities. IPC properties were returned to the firm in March 1967 when Syria and IPC signed an agreement under which IPC is to pay Syria about 11 cents per barrel transit fee (up from about 7½ cents) plus about 4 cents per barrel of oil shipped from the port of Baniyas (up from about 2½ cents). A lump-sum payment was also made by IPC to make the higher fees retroactive to January 1, 1966. An agreement was also reached between the parties to continue to study claims by Syria for a sizable backpayment of taxes. The transit fees are among the highest in the world.

PRODUCTION

Crude mineral production appeared to be continuing a minor upward trend in 1966 and 1967. However, data for 1967 is too incomplete to warrant firm conclusions. A reduction in cement production can be traced to reduced demand. In an effort to regain former production levels, Syria has attempted to sell cement beyond her borders through the use of highly competitive measures.

Petroleum refining continued a slow upward trend (+3 percent) in 1966 and can be expected to continue in this direction. Increases will probably be more marked when Homs refinery expansion is completed.

Table 1.—Syrian Arab Republic: Production of mineral commodities

Commodity	1963	1964	1965 e	1966	1967 e
Nonmetals:					
Cement—thousand metric tons	685	635	r 835	617	600
Glass sand—do	NA	NA	10	10	10
Gypsum—do	e 15	20	15	15	15
Salt—do	15	16	21	20	20
Mineral fuels:					
Asphalt, natural—metric tons	36,782	36,000	56,900	60,000	60,000
Petroleum refinery products:					
Gasoline—thousand 42-gallon barrels	1,076	1,223	1,293	[1] 1,418	NA
Kerosine and jet fuel—do	819	938	1,131	[1] 1,116	NA
Diesel fuel—do	1,881	2,138	1,939	[1] 2,099	NA
Residual fuel—do	2,222	2,532	2,777	[1] 2,792	NA
Asphalt—do	158	185	180	[1] 190	NA
Liquefied petroleum gas—do	84	92	96	[1] 69	NA
Total refinery products—do	6,240	7,108	7,416	7,684	NA

e Estimate. r Revised. NA Not available.
[1] Source: Directorate of Statistics, Ministry of Planning, Syrian Arab Republic, Damascus. General Bulletin of Current Statistics for 1966 (two volumes).

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TRADE

There was no appreciable change in 1965 or 1966 in Syria's dependence upon imports of metals, industrial minerals, and most commercial fuels. By 1966, total imports reached $291 million and mineral commodity imports totaled $65.9 million as indicated in the following tabulation comparing mineral trade and total trade in the latest years for which such data are available:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	1.8	169	1.06
1966	1.0	173	.59
Imports:			
1965	39.8	216	18.4
1966	65.9	291	22.6
Trade balance:			
1965	−38.0	−47	XX
1966	−64.9	−118	XX

XX Not applicable.

In August 1967, a product exchange between Syria and the U.S.S.R. was agreed upon, and there are other indications that Syria has been intensifying trade with Communist countries. This trend is reflected in data on Syrian mineral commodity trade; the U.S.S.R. and the Communist countries of Eastern Europe have appeared with increasing frequency as import sources, and the quantities of minerals each sends to Syria have been increasing.

However, so dire is Syria's foreign exchange picture, that even these countries may decrease shipments to Syria until monies already borrowed are repaid.

Table 2.—Syrian Arab Republic: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Iron and steel:			
Scrap	7,240	3,999	Yugoslavia 2,500; Cyprus 1,295.
Semimanufactures	r 68	38	Saudi Arabia 19.
Lead: Scrap and semimanufactures	70	10	Saudi Arabia 8; Jordan 2.
Nonmetals:			
Abrasives, all types	58	80	Lebanon 29; Jordan 19.
Gypsum	8,453	26,336	Lebanon 25,890; Jordan 446.
Talc	82	174	All to Jordan.
Mineral fuels:			
Asphalt	560	300	All to Cyprus.
Petroleum refinery products:			
Gasoline			
thousand 42-gallon barrels	r 786	321	All to West Germany.

r Revised.
Source: Ministere Des Finances, Damascus. Statistiques Du Commerce Exterieur. 1966, 935 pp.

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Table 3.—Syrian Arab Republic: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Unwrought and scrap	435	118	Lebanon 57; Kuwait 22.
Semimanufactures	1,320	1,740	Lebanon 549; mainland China 336; Hungary 197.
Copper:			
Ingots, including scrap	50	9	Saudi Arabia 4; Kuwait 4.
Semimanufactures	1,058	1,131	Italy 392; Yugoslavia 291; Japan 250.
Gold, platinum, and alloys_troy ounces	15,896	6,352	United Kingdom 3,295; France 2,757.
Iron and steel:			
Pig iron	318	1,331	U.S.S.R. 1,230; Bulgaria 99.
Scrap	1,585	946	Saudi Arabia 367; Lebanon 292; Belgium 141.
Semimanufactures	r 77,281	126,638	Hungary 30,601; U.S.S.R. 15,874; Czechoslovakia 12,292.
Lead:			
Ingots	485	228	Netherlands 100; Australia 30.
Semimanufactures	11	124	Saudi Arabia 100; Belgium 14.
Silver_troy ounces	575	3,414	United States 2,251; France 1,125.
Tin:			
Ingots_long tons	82	90	Malaysia 59; mainland China 18.
Semimanufactures_do	---	116	United Kingdom 109.
Zinc, all forms	121	212	United Kingdom 113; Jordan 36.
Nonmetals:			
Abrasives, all forms	188	365	United Arab Republic 288; Greece 34.
Asbestos	4,248	5,100	Lebanon 3,467; Czechoslovakia 1,004.
Cement	20,098	15,279	Yugoslavia 7,010; Denmark 3,172; mainland China 2,200.
Chalk	1,405	1,215	France 865; Belgium 350.
Clays	76	126	Greece 45; West Germany 34; United States 24.
Fertilizers (minerals and chemicals)	75,666	82,363	West Germany 48,305; Lebanon 10,806; Yugoslavia 8,603.
Fuller's earth	392	6,564	Yugoslavia 6,400; United States 55.
Graphite	26	52	West Germany 35; mainland China 15.
Magnesite	15	10	All from India.
Marble	4,944	2,671	Italy 2,253; Jordan 229.
Ocher and other earth colors	64	66	Spain 36; Lebanon 25.
Salt	15,641	29,308	Rumania 11,710; United Arab Republic 9,547; Jordan 8,044.
Sand (including quartz)	1,260	991	Lebanon 962; West Germany 26.
Stone, building	1,782	1,273	West Germany 318; Italy 290; mainland China 231.
Sulfur	901	2,043	France 933; West Germany 459.
Talc	493	780	Mainland China 778.
Mineral fuels:			
Asphalt	1,454	2,336	Italy 2,086; United Kingdom 115.
Coal (including briquets)	r 2,257	615	Belgium 560; United Kingdom 50.
Coke	3,166	2,884	West Germany 2,198; Netherlands 421.
Petroleum:			
Crude_thousand 42-gallon barrels	7,581	7,859	All from Iraq.
Refinery products:			
Gasoline_do	87	70	United States 46; Curacao 16.
Kerosine_do	70	58	Aden 20; Italy 11.
Diesel fuel oil_do	982	7,473	U.S.S.R. 3,797; Rumania 2,987.
Lubricants_do	125	159	United Kingdom 65; Italy 21.
Liquefied petroleum gas_do	11	6	Italy 4; Jordan 2.
Other_do	6	4	Rumania 2; West Germany 1.
Total liquids_do	1,281	7,770	

r Revised.

Source: Ministere Des Finances, Damascus. Statistiques Du Commerce Exterieur. 1966, 935 pp.

COMMODITY REVIEW

METALS

Iron and Steel.—In 1966, the Government decided to set up a steel mill at Hama. A Polish firm won the contract to provide the materials and erect the mill, which was to be completed in 22 to 30 months. It was announced that the plant would make about 75,000 tons of steel reinforcing bars and mouldings annually and that it would employ 300 workers and

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technicians. Initial costs were said to be equivalent to about $7.8 million and a $400,000 per year saving in foreign exchange was projected. No information was available as to the source of financing of the plant nor as to its raw material source.

NONMETALS

Cement.—Production began at a Soviet-assisted cement railroad tie plant in 1966. It was planned that the plant would produce around 40,000 ties per year. Beginning in 1966, the new railroad linking the damsite with the major industrial and transportation point of Aleppo, and the new Latakia-Qamishly railroad were to use the products of the plant. High-quality gravel was to be trucked from the Euphrates Valley to the plant site. Meanwhile, a factory that would make 40 concrete telephone poles per day was scheduled to begin operation at Aleppo during the summer of 1967.

Fertilizer Materials.—The fertilizer complex under development since October 1966 at Homs will satisfy all of Syria's demand for nitrogenous fertilizers according to the Syrian Ministry of Industry. The Italian contractor, Societa Nazionale Metandoti Progetti (SNAM Progetti), was retained to build a 50,000-ton-per-year ammonia plant within the Homs petrochemical complex. This plant, estimated to cost $5.5 million, was due for completion during 1967. Overall cost of the Homs fertilizer installation will run around $30 million, and completion remained set for 1968.

Phosphate rock occurrences west and southwest of Palmyra, in central Syria, continued to attract interest although no very high quality deposits have been found. Phosphorus pentoxide content varies from 24 to 28 percent. Late in 1966, a contract was to be signed under which the phosphate would be mined for domestic market and for export. A concentrating plant is planned and exports will go out through the port of Tartous.

MINERAL FUELS

Petroleum.—Several oilfields in extreme northeastern Syria, heretofore not exploited, have been under development in anticipation of the scheduled 1968 completion of a pipeline linking the fields to the Homs refinery and the port of Tartous on the Mediterranean. Reserves of the three large government-owned fields (Suwaydiyah, Karatchuk, and Rumaila) were officially estimated at slightly over 1 billion barrels. Suwaydiyah, with 30 wells ready, was to begin deliveries in early 1968. Total annual output from the fields is expected to reach 4 million tons (30 million barrels) within a few years. The crude oil is 22° to 24° API gravity and high in sulfur (4 percent). The U.S.S.R. has provided most of the materials, technical manpower, and financial credit for field development.

Construction of the 22-inch, 640-kilometer pipeline to Tartous via the Homs refinery was completed in mid-November by Italy's SNAM Progetti firm, while field gathering and terminal storage construction was apparently almost complete at yearend. Pipeline construction had been started by a British consortium that removed itself from the job in 1966.

Syria's only refinery, the state-owned Homs facility, was undergoing redesign, expansion, and modernization by a Czechoslovakian contracting company to permit it to produce 55,000 barrels of products daily from Syrian crude by yearend 1968. Its premodernization capacity was about 20,000 barrels daily and it used Iraqi crude oil. The General Petroleum Authority plans to use only Syrian crude oil at Homs after modernization is completed and expects to be ready to deliver that portion of Syria's crude oil output not used at Homs to world markets in 1968.

An Italian proposal to build a products pipeline from Homs to the port of Latakia was under government consideration.

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The Mineral Industry of Taiwan

By R. A. Pense [1] and J. M. West [2]

Taiwan's mineral industry, while still dependent on coal mining for approximately three-quarters of its extractive product income, engaged increasingly in processing imported materials, such as crude petroleum, steel scrap, phosphate rock, and bauxite. Although natural gas and crude petroleum were produced in growing quantities, output of other traditional products, including copper ore, gold, silver, pyrite, and sulfur, continued to be on a limited scale. During 1967 aluminum, cement, fertilizer, glass, petroleum-refining, and petrochemical capacities were expanded, and plans for a new, integrated iron and steel mill were advanced.

The island nation's economy continued to make noteworthy progress. The 1967 gross national product (GNP) was estimated at $3,421 million [3] (in 1964 prices), a gain of almost 9 percent over that of 1966. The extractive sector of the mineral industry probably accounted for about 1.5 percent of the GNP. Combined with substantial annual increases in GNP in other recent years, all of which exceeded the projected 7 percent per annum rise under the fourth 4-year plan (1965–68), the unexpectedly large 1967 boost was allegedly causing economic planners to consider raising the annual GNP growth objective to 8 percent or more for the fifth 4-year plan (1969–73).

Mining and manufacturing together contributed an estimated production value of $1,882 million to the economy in 1967, about 19 percent more than in 1966. Mining alone contributed an estimated $90.7 million, roughly 16 percent more than in 1966. Overall production indices, including components of mineral processing and consumption and major elements of the extractive sector, follow (1961=100):

Economic sector	1965	1966	1967
Manufacturing (sugar processing excluded)	r 198.4	226.6	272.6
Construction of buildings	532.6	836.9	1,041.2
Public utilities	154.6	175.4	199.6
Metal mining	90.9	117.4	107.3
Salt evaporation	r 138.6	92.5	120.8
Miscellaneous mining, nonmetallic mining, and quarrying	128.9	154.0	164.2
Coal mining	116.9	116.0	117.5
Crude petroleum and natural gas	833.1	1,193.1	1,424.9

r Revised.

Employment in the extractive mining industry reportedly totaled about 109,000 at the beginning of 1967, distributed as follows, in percent: coal mining, 75; stone and sand quarrying, 12; salt, 6; metallic, 4; petroleum, 2; and miscellaneous 1. Approximately 9,000 of those employed were administrative, professional, or clerical personnel. Of the remaining 100,000 workers, about 58,000 were employed underground and 42,000 on the surface.[4]

The electric power industry continued to grow in 1967, but not fast enough to meet demand from industry, which con-

[1] Research specialist, Division of International Activities.

[2] Physical scientist, Division of International Activities.

[3] Where necessary, values have been converted from New Taiwan dollars (NT$) to U.S. dollars at the rate of NT$40.10=US$1.

[4] Labor Force Survey Research Institute of Taiwan Provincial Government. Manpower Requirements Pilot Survey Report on Mining Industry. 1967, 64 pp.

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sumes four-fifths of all electricity generated. The Government-owned Taiwan Power Company (Taipower), the country's principal generator, contracted to sell, on a regular basis during 1967, about 17 percent more power than it had available on a reliable basis, and as in 1966, several mineral-processing industries were forced to make temporary production cutbacks because of power shortages. To meet the immediate crisis a 68,000-kilowatt addition was rushed to completion at the Nanpu thermal powerplant in 1967, raising Taipower's total installed capacity to slightly over 1.5 million kilowatts at yearend. An additional 395,000 kilowatts were scheduled to go on stream in 1968. Nevertheless, the power situation will probably continue to be critical over the next few years, with the possibility that industrial growth, including mineral processing, may be hampered. Taiwan's electric power demand and supply were resurveyed in 1967 by experts from the Detroit Edison Company, but results were not revealed.

Foreign investors' interest in Taiwan remained high in 1967, particularly in labor-intensive projects. Foreign investment, somewhat less than half from the United States, was estimated at slightly over $60 million, roughly double the 1966 amount. Official Chinese sources show that "overseas Chinese" and Japan were other important sources of investment. Advantageous tax and customs treatement, industrious low-cost labor, and policies permitting repatriation of profits and capital apparently were responsible for accelerated foreign investment.

The Government's efforts to encourage investment were implemented by the official opening of the Kaohsiung Export Processing Zone in late 1966. Incentives for establishing enterprises in this zone, where goods are produced specifically for export, include: exemption of machinery and equipment, supplies, and semifinished products from import duty if imported for a company's own use; exemptions from commodity and business taxes; a 5-year corporate tax holiday under certain conditions; and remittance of all net profit or interest earned annually after the first year, plus 15 percent annually of the total invested after 2 years from the date the operation begins. Progress in developing this zone has been slow. By mid-1967 only about 20 plants employing 3,000 workers were in operation, although 120 plants with 30,000 workers had been expected by yearend. Total investment was apparently falling far short of the $18 million projected for 1967. As a result, the target date for the completion of development of this zone, whose production value is expected to reach $75 million annually, was extended to yearend 1969.

The establishment of special Petrochemical Industrial Districts was also being discussed as an incentive for investors to help develop Taiwan's petroleum resources to their maximum. One of these districts was to be founded near Maoli in west-central Taiwan, where natural gas is already being used to produce fertilizers. The other was to be located near Kaohsiung in southwestern Taiwan, where projects for using naphtha from the country's only oil refinery to make artificial fibers were well underway.

PRODUCTION

The most noteworthy trends in 1967 production were increases in some crude mineral fuels and rises in output in several areas of mineral processing. Extraction of natural gas and petroleum showed significant increases over 1966, although far below the rates of increase for previous years. Coal output, however, remained virtually stationary during 1967. Processing industries, such as cement, petroleum refining, glass, and fertilizer production, apparently enjoyed sizable increases.

Of the total value contributed to the economy by identified components of minerals and mineral processing in 1967, metals and metal products contributed an estimated $103.3 million, nonmetallic minerals and mineral processing contributed an estimated $131.3 million, and mineral fuels and products, added $186.6 million.

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Table 1.—Taiwan: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Alumina e	26,000	43,000	42,000	42,000	42,000
Aluminum ingots	11,928	19,372	18,912	17,217	15,440
Aluminum sheet	5,687	8,104	9,237	9,422	10,398
Copper:					
Ore, 0.61 to 0.77 percent Cu	117,618	119,973	114,191	139,290	85,014
Concentrates, 13 to 16 percent Cu	8,272	9,291	10,313	9,302	10,658
Mine	1,619	1,738	e 1,900	e 2,500	e 2,300
Electrolytic copper	1,481	r 1,887	r 2,189	r 2,411	3,001
Gold:					
Gold-copper ore	170,392	200,494	212,500	219,547	262,954
Gold ore	1,553	1,483	1,581	2,348	2,941
Refined gold troy ounces	31,710	17,660	32,148	41,805	32,414
Iron and steel:					
Iron ore:					
Limonite, 35 to 40 percent Fe	576	1,021	5,633	3,444	2.720
Magnetite, 50 percent Fe	4,705	5,877	8,852	10,121	9,879
Pig iron thousand tons	54	62	72	71	85
Steel ingots and castings do	275	300	440	300	e 250
Rods, bars, and slabs do	215	236	r 385	326	443
Silver troy ounces	61,440	60,633	87,315	79,472	115,794
Nonmetals:					
Asbestos	548	477	801	654	572
Cement thousand tons	2,246	2,355	2,444	3,112	3,520
Clays:					
Ceramic and pottery do	40	40	e 47	55	57
Paper filler do	3	3	e 4	4	4
Used in cement do	460	471	e 550	620	634
Brick and tile do	500	500	e 713	820	830
Total do	1,003	1,014	1,314	1,499	1,525
Dolomite, about 19 percent MgO	30,904	32,684	50,577	51,578	56,972
Gypsum, 75 to 96 percent gypsum	26,588	17,094	27,758	8,413	11,457
Lime	79,491	91,275	102,954	106,971	92,902
Limestone thousand tons	3,680	3,717	4,076	5,167	5,727
Pyrites, 25 to 45 percent sulfur	46,760	46,324	39,260	42,005	38,696
Salt, sea thousand tons	626	602	560	411	517
Sand, glass do	80	94	115	125	126
Sulfur:					
Refined, 97 to 99 percent sulfur	7,259	6,492	4,495	4,595	e 3,425
Contained in pyrites	17,242	17,081	16,000	16,900	e 14,920
Recovered from refinery gases, 99 percent sulfur	2,347	2,825	2,386	2,375	e 3,065
Talc, mostly soapstone grade	14,787	16,981	15,229	28,752	41,315
Mineral fuels:					
Coal, subbituminous to high-volatile bituminous thousand tons	4,810	5,028	5,054	5,015	5,078
Coke:					
Coke oven and beehive (including semi-coke) thousand tons	199	r 203	r 211	e 211	e 207
Gas plants do	34	r 42	r 46	e 46	e 45
Total do	233	245	257	257	252
Natural gas million cubic feet	1,890	6,322	11,557	r 15,507	18,616
Petroleum:					
Crude thousand 42-gallon barrels	19	61	131	226	246
Refinery products:					
Gasoline do	2,065	2,170	r 2,244	2,739	2,889
Kerosine do	248	r 246	r 189	213	162
Jet fuel do	NA	1,390	1,673	2,072	NA
Distillate fuel oil do	r 1,360	r 1,724	r 2,166	2,354	3,039
Residual fuel oil do	r 3,852	r 3,937	r 5,853	7,414	7,092
Asphalt do	315	245	325	483	626
Lubricant oils and feedstocks do	------	------	97	540	603

e Estimate. r Revised. NA Not available.

TRADE

According to preliminary data, Taiwan's overall trade increased substantially in 1967. Imports rose 37 percent over 1966, to $826 million, and exports about 15 percent, to $669 million. Industrial equipment and raw materials, including ores, petroleum, and chemical materials were the main imports, reflecting the country's

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accelerated efforts at economic development, and industrial products accounted for the largest part (60 percent by value) of exports. Japan ($152 million), the United States ($129 million), South Viet-Nam ($99 million), the Federal Republic of Germany ($42 million), and Hong Kong ($41 million) were the principal destinations for Taiwan's exports.[5]

The role of mineral commodities in Taiwan's total trade in 1965 and 1966 is shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Gross exports:			
1965	35.1	449.8	7.8
1966	53.2	536.5	9.9
Gross imports:			
1965	133.3	557.4	23.9
1966	150.0	624.2	24.0
Net trade balance:			
1965	−98.2	−107.6	XX
1966	−96.8	−87.7	XX

XX Not applicable.
Source: Statistical Office of the United Nations.

Among the principal items exported in 1966 were cement, the total value of which ($18.7 million) was more than twice that of 1965; iron and steel products ($15.8 million); and petroleum (mostly lubricating oil feedstocks), manufactured fertilizers, and aluminum and aluminum alloy products (each approximately $3.4 million).

Included with the major items imported in 1966 were raw materials used by Taiwan mineral and metal processing industries. These were iron and steel scrap ($13.0 million), iron and steel semimanufactures ($45.1 million), and crude oil ($39.6 million). Among the more important manufactured mineral and metal products imported were copper ($6.4 million), fertilizers ($5.0 million), and lubricating oils and greases ($3.6 million). Because of the rapid growth of Taiwan's own fertilizer industry, the 1966 foreign exchange expenditure for manufactured fertilizer was considerably less than one-half of that in 1965.

[5] Chinese Information Service. News From China, Jan. 5 and 11, 1968.

Table 2.—Taiwan: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum and alloys, unwrought and semimanufactures	8,436	6,671	South Korea 1,618; South Viet-Nam 1,480; Japan 1,000.
Copper:			
Ore and concentrate	12,840	15,407	All to Japan.
Unwrought and semimanufacturers	260	657	South Viet-Nam 566; Singapore 75.
Iron and steel:			
Pig iron	5,945	9,705	South Viet-Nam 9,698.
Semimanufactures—thousand tons	r 80	115	South Viet-Nam 96; Thailand 11.
Ferroalloys	1,290	2,802	South Viet-Nam 1,276; Thailand 1,066.
Nonmetals:			
Asbestos	87	69	Philippines 68.
Cement:			
Portland—thousand tons	668	1,193	South Viet-Nam 1,055.
White	12,690	15,147	South Viet-Nam 12,082; Philippines 2,735.
Fertilizers, manufactured	32,013	31,235	South Viet-Nam 31,121.
Salt—thousand tons	302	130	Japan 108.
Mineral fuels:			
Coal—do	2	(1)	
Coke	12,977	15,476	South Viet-Nam 6,860; Philippines 3,800.
Petroleum refinery products:			
Gasoline—thousand 42-gallon barrels	36	37	All to Thailand.
Fuel oil—do	247	(1)	
Lubricants and feedstocks—do	3	171	Japan 146; Hong Kong 17.
Pitch and asphalt—do	76	110	South Viet-Nam 79; Hong Kong 12.

r Revised.
1 Less than ½ unit.
Source: Chinese Maritime Customs, Statistical Department, Inspectorate General of Customs (Taipei, Taiwan). The Trade of China 1965 (pub. 1966), 481 pp.; 1966 (pub. 1967), 507 pp.

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Table 3.—Taiwan: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys:			
Bauxite	104,741	90,348	Malaysia 89,010.
Scrap	1,211	1,734	United States 815; Hong Kong 676.
Unwrought and semimanufactures	691	1,740	United States 908; Japan 454.
Chromium ore and concentrate	270	880	Philippines 780; Japan 100.
Copper and alloys, unwrought and semimanufactures	r 5,561	4,881	Japan 4,379; Australia 231.
Iron and steel:			
Ore and concentrate	31,103	106,641	Malaysia 106,615.
Scrap—thousand tons	r 439	272	United States 156; Hong Kong 51.
Pig iron	-------	2,664	All from Japan.
Ferroalloys and special steel	r 13,263	14,590	Japan 13,162; United States 1,099.
Billets, blooms, and other unwrought products	6,332	14,527	Australia 11,144; Japan 2,584.
Semimanufactures—thousand tons	257	318	Japan 282.
Lead and alloys, unwrought and semimanufactures	3,256	3,736	Japan 1,382; Australia 1,270; Peru 898.
Manganese dioxide	1,122	2,226	Japan 1,626; Belgium 275.
Mercury—76-pound flasks	2,008	928	United States 464; Mexico 261.
Nickel, unwrought and semimanufactures	125	138	Canada 75; Norway 52.
Tin and alloys, semimanufactures—long tons	r 228	387	Malaysia 348; Singapore 16.
Titanium dioxide	1,589	2,327	Japan 1,494; Australia 314.
Zinc, unwrought and semimanufactures	6,067	7,093	Japan 4,466; Australia 1,946.
Other: Metal scrap n.e.s.	1,285	1,333	Hong Kong 792; Ryukyu Islands 173.
Nonmetals:			
Abrasives	980	1,285	Japan 1,149; United States 135.
Asbestos	1,630	2,366	Canada 1,116; Republic of South Africa 854.
Fertilizer materials:			
Crude: Phosphate rock	e 116,000	46,017	All from Morocco.
Manufactured:			
Ammonium sulfate	110,737	23,350	Japan 21,850.
Other nitrogenous	72,540	46,401	All from Japan.
Calcium phosphate	1,126	1,033	United States 968.
Potassic	90,270	31,761	Canada 14,961; West Germany 10,500.
Graphite:			
Plumbago	2,892	2,794	South Korea 2,713.
Other	123,270	112,918	Morocco 85,719; Japan 13,495.
Gypsum	45,201	72,592	Australia 41,297; Cyprus 31,127.
Sulfur	118,662	69,304	United States 36,467; Canada 26,312.
Mineral fuels:			
Coal	18	9,330	Australia 9,329.
Petroleum:			
Crude oil—thousand 42-gallon barrels	10,428	19,202	Iraq 13,127; Kuwait 4,797.
Refinery products:			
Fuel oil	132	1,241	Kuwait, 1,107; Saudi Arabia 115.
Lubricants—do / Grease—do	190	190	Japan 106; United States 77.
Paraffin wax—do	18	27	Japan 14; Indonesia 12.
Transformer oil—do	9	12	Japan 8; United States 3.
Pitch and asphalt—do	22	33	West Germany 24; United States 7.
Petroleum coke—do	97	58	All from United States.

e Estimate. r Revised.

Source: Chinese Maritime Customs, Statistical Department, Inspectorate General of Customs (Taipei, Taiwan). The Trade of China 1965 (pub. 1966), 481 pp.; 1966 (pub. 1967), 507 pp. Statistical Office of the United Nations.

COMMODITY REVIEW

METALS

Aluminum.—During 1967 the Taiwan Aluminium Corp. (TALCO), the country's Government-owned and only fully integrated aluminum enterprise, continued an overall expansion program. Costing an estimated $11.3 million, the project involves enlarging and modernizing the alumina-producing facility, raising the primary aluminum-producing capacity, and installing new rolling equipment. Under a contract signed in 1966 with Vereinigte Aluminum Werke A. G. of West Germany involving technical assistance, the annual capacity of the alumina facility is being raised from its present 42,000 tons to

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75,000 tons. Annual primary aluminum capacity (32,000 tons in 1967) is to be increased to 38,000 tons by the end of 1969 through the addition of more electrolytic reduction cells supplied by Péchiney Co. of France. New rolling facilities, provided principally by Schloemann A. G. of West Germany, including hot, strip, and temper mills, and three reheating furnaces, are to go into operation during the first quarter of 1968, expanding total products capacity to 25,000 tons annually.[6]

To meet additional demand created by the increased electrolytic refining capacity, a new 25,000-kilowatt generator is being added to the company powerplant. It will also lessen the company's dependency on the supply of power from the public utility system, the irregularity of which has hampered company activities in recent years. Bauxite from Malaysia continues to be the principal raw material for the company's operations.

Copper and Gold.—Mines in the Chinkuashih area of northern Taiwan continued to produce a substantial amount of copper ore which was sent to Japan for processing and a small amount of gold. The discovery of a "new" vein of gold in this area was announced in 1966 but appeared, by late 1967, to have been ephemeral. Large-scale geochemical prospecting for additional reserves of copper, initiated in 1965 by the Mining Research and Service Organization in cooperation with the National Taiwan University, continued. The project included heavy mineral reconnaissance in the Chinkuashih area, soil prospecting at Penshan, the study of dacite and ore relationships, and stream sediment investigations for copper in eastern Taiwan.

Iron and Steel.—Despite the addition, in late 1966, of a small rolling mill to the Taiwan Iron Manufacturing Company facilities, making it the country's first integrated steel plant, movement towards government establishment of a completely new medium-size integrated plant continued throughout 1967. A project for a conventional plant with blast furnaces appeared to be gaining favor over a proposal to build a somewhat unorthodox plant that would use Taiwan's natural gas resources to smelt iron ore directly into sponge iron. During the first stage of the conventional scheme hot- and cold-strip rolling facilities, a plate mill and an electrolytic tinning line would be erected; capacity would initially be about 400,000 tons annually of products rolled from imported slabs. The second stage development of the plant into a fully integrated operation would presumably await expansion of the Taiwan market to a size capable of supporting an economically viable installation with an annual output of 1 to 2 million tons of steel. Japanese assistance is allegedly available for part of the cost of this more ambitious scheme through an existing aid agreement. Three of Japan's major steel companies would provide the necessary technology and equipment.

Nevertheless, at yearend 1967 Taiwan's steel industry was still characterized by numerous small producers that rolled ingots by remelting steel scrap in electric arc or Bessemer converter furnaces. Some low-grade domestic iron ore was utilized, in combination with higher grade ore imported principally from Malaysia, in the manufacture of pig iron in two blast furnaces and a number of electric smelting furnaces. About 80 to 85 percent of the product capacity was devoted to the production of steel reinforcing bars and rods.

NONMETALS

Cement.—Output of cement, which rose sharply in 1966 under the demand created by the conflict in South Viet-Nam, increased more moderately in 1967. The production cutback, which was occasioned by a power shortage in August, was a contributing factor in the failure of the industry to reach its goal of 3.9 million tons. As a result of this shortfall, the continued upsurge in domestic demand by the construction industry, and prior export commitments, a shortage developed in the internal market. Prices increased by more than 75 percent. In October the Government temporarily forbade producers to accept further foreign requisitions and ordered the immediate purchase from abroad of 30,000 tons of cement. This marked the second consecutive year that Taiwan, allegedly the fourth largest exporter of cement in the world, has had to import. Nevertheless, a goal of 4.4 million tons of cement which was set for 1968, and tax benefits on exported cement, which have encouraged producers to sell internationally, were apparently left undisturbed.

[6] Taiwan Aluminum Corp. Annual Report 1966, 16 pp.

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Three more kilns were added during 1967, raising the industrial capacity at yearend to 4.1 million tons. The capacity of the Taiwan Cement Corp., the island's largest producer, was increased to 1.6 million tons during 1967.

Fertilizer Materials.—Among the various chemical fertilizers produced in 1967 were ammonium sulfate, calcium superphosphate, urea, nitrochalk, calcium cyanamide, anhydrous ammonia, nitrophosphate, and compound fertilizers. Output of most types, including the first three which account for about 85 percent of total production, appeared headed for new highs near yearend. Of nine fertilizer plants operating in 1967, seven were owned and operated by the Central Government-controlled Taiwan Fertilizer Co., one by the Provincial Government's Kaohsiung Ammonium Sulphate Corp., and one by Mobil China Allied Chemical Industries, Ltd.

Throughout 1966 and 1967 the Taiwan Fertilizer Co. continued to place orders for new fertilizer facilities with Japanese companies, financing them through Japanese credits. Mitsubishi Heavy Industries, Ltd., received $7.8 million to erect a liquid ammonia facility using natural gas and producing 545 tons of ammonia daily. Toyo Koatsu Co., Ltd., and Toyo Engineering Co., Ltd., received $3.7 million to construct ammonium sulfate and urea manufacturing units, with daily capacities of 450 and 300 tons, respectively. Nippon Kokan K.K. received $2 million to build a mixed fertilizer unit which would produce 400 tons daily. With the completion of these facilities (probably in 1969) Taiwan's production of fertilizers will reach nearly 1 million tons annually. Self-sufficiency in nitrogenous fertilizers is expected, but imports of potassic and phosphatic raw materials will still be required.

Silica Sand and Glass.—Glass production, largely based on domestic silica sands, has made considerable progress in recent years. Output has risen from about 55,000 tons in 1963 to approximately 120,000 tons in 1967. Hsinchu Glass Works, Taiwan's largest glass producer, brought its fifth plant into operation during 1967. Using natural gas as a fuel, this plant has an annual capacity of 700,000 cases of sheet glass, or an estimated 50,000 to 100,000 tons. Technical assistance during construction was supplied by Saint Gobain Corp. of the United States and Deutsche Tafeglass, A.G. of West Germany. This brought the company's capacity up to 1,350,000 cases of sheet, polished plate, safety, obscured, and frosted glass. An additional plant was built at Toufen by Taiwan Glass Corp., a newcomer to the island's glass industry. Annual capacity of this plant was 400,000 cases of sheet glass and 200,000 cases of other glass. As a result of these developments, demands for high-quality silica sands are expected to more than double.

MINERAL FUELS

Coal.—Despite Taiwan's growing fuel demands, coal production in 1967 was only slightly higher than in 1966, and considerably short of the 5.7 million tons projected for the year. Inability of the coal industry to provide desired amounts of coal for thermal power generation was allegedly one of the factors in the power deficits that adversely affected operations of the aluminum and cement industries during 1966 and 1967.

Natural Gas.—Proven reserves of natural gas at the beginning of 1967 were estimated at 960 billion cubic feet, nearly 50 years' supply at 1966 production rates. Consumers are located principally near the Miaoli area of west-central Taiwan where most of the gas has been found. In 1967 consumers included an ammonia-urea fertilizer plant of Mobil China Allied Chemical Industries, Ltd., several glass factories of Hsinchu Glass Works, the Tunghsiao powerplant of Taipower and about 10,000 homes in five nearby towns. Extension of pipelines to the major urban areas of central and southern Taiwan was discussed. Priority in use is expected to be given to petrochemicals, however, particularly for the production of intermediate feedstocks such as acetylene, which is used in the manufacture of artificial fibers.

Petroleum.—Although domestic crude oil production continued to rise in 1967 after a 73-percent jump in 1966, the amount produced still provided only a very minor portion of Taiwan's petroleum needs. To increase reserves, which stood at 18.9 million barrels at the beginning of 1967, the Government-owned Chinese Petroleum Corp. (CPC) continued its 4-year program of exploration that was

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initiated in 1965. Geological surveys and drilling led to the 1966 discovery of oil near Hsinchu, which had a reported specific gravity of 43° API in the well and a reported maximum daily output of 1,000 barrels of oil and 2.5 million cubic feet of natural gas. No new finds were announced during 1967.

Substantial advances were made, however, in reaching self-sufficiency in petroleum processing. The country's only refinery, the Kaohsiung installation of CPC, appeared to be well along on a program to boost capacity to 110,000 barrels daily, with completion set for July 1968. Plans were also being made to raise capacity thereafter to 250,000 barrels. With the principal exceptions of relatively small amounts of lubricants and greases, and an emergency supply of residual fuel oil imported in 1966 for use in power generation, this plant was able to meet virtually all of Taiwan's liquid fuel requirements. Sulfur recovered from refinery gases was used in CPC's chemical and petrochemical producing activities. Output of the 1,500-barrel-per-day lubricating oil plant of China Gulf Oil Corp., which went into commercial operation in October 1965, met the domestic market demand for locally produced products in 1966 and 1967 and provided a substantial surplus for export, as originally planned. However, lubricant imports were necessary to meet the requirements of some consumers.

Tentative plans were announced in 1967 for the building of a second refinery near Keelung in northern Taiwan. Unloading facilities would be built to accommodate two 80,000-ton tankers discharging offshore simultaneously. The refinery would provisionally provide two new major thermal powerplants with residual fuel oil. In addition, the port of Kaohsiung was scheduled to be expanded to receive 70,000-ton tankers, and negotiations by the CPC and the Mobil Oil Corp. with unidentified Italian interests for the construction a 75,000-ton tanker were launched.

Civilian demand in 1967 for products, including bunkers, was projected to include 8,050,000 barrels of residual fuel oil, 2,350,000 barrels of distillate fuel oil, 1,720,000 barrels of gasoline, and 550,000 barrels of other products. Of the total amount of 12,670,000 barrels, industry was expected to consume 49 percent (mostly residual fuel oil), transportation 34 percent (mostly distillate fuel oil and gasoline), fishing fleets 14 percent, and residential and commercial heating and lighting the remaining 3 percent.

Several new petroleum-based petrochemical units were believed to have come on stream during 1966 and 1967. The most important of these probably was a polyethylene facility at Kaohsiung completed in 1967 by Taiwan Polymers Corp. Designed to use ethylene produced by a new naptha-cracking unit at CPC's nearby refinery, this facility is to manufacture 40 million pounds of low-density polyethylene annually.

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The Mineral Industry of Thailand

By A. F. Grube [1]

Thailand's mineral industry, a significant foreign exchange earner, has expanded even faster than the gross national product (GNP). The share of minerals increased from approximately 0.7 percent of the GNP in 1958 to about 1.7 percent in 1967. Overall mineral output value increased fourfold during 1958–67, primarily as a result of increased tin and cement production. Also contributing to the rising importance of minerals were advances in tin and oil refining, fertilizer manufacturing, and the discoveries of new deposits of tin, tungsten, columbium-tantalum, iron, and copper ores.

As an indication of the vigor of the Thai economy, the country's gross national product amounted to $4.7 billion in 1967, a 6-percent increase in real terms over that of the previous year. In fact, annual GNP growth rate averaged over 8 percent for the 1960–67 period. Expansion has been fostered by a stable government, investment incentives, sound fiscal policy, expansion of the country's infrastructure, and government support of free enterprise.

During the 1967 fiscal year (October-September) actual and planned investments in Thailand registered a substantial increase. The Thailand Board of Investment indicated that the estimated value of promoted industries was nearly double that of the previous fiscal year—$93.6 million as compared with $52.7 million. Out of 155 applications received, the Board approved more than 100. Over 20,000 persons are to be employed in these enterprises. The United States' contribution to private investment also increased sharply. According to one survey United States investments amounted to $110 million at yearend 1966 as contrasted with $25 million at yearend 1960. A major portion of this increase was the investment of about $7 million by the Union Carbide Corp. in a tin smelter at Phuket.

Tin continued to outrank cement—Thailand's No. 2 mineral product—by a wide margin and overshadowed all other minerals. Output of the metal in 1967 showed little change from that of 1966 and was 18 percent greater than that of 1965. In recent years, the country has been the world's third largest producer of tin. Thailand also produced significant amounts of fluorspar, antimony, and tungsten. Furthermore, prospects for increased production of manganese were excellent.

During 1967 Thailand enacted both a minerals law and a petroleum law. In accordance with these laws offshore areas in the Gulf of Siam were awarded to international petroleum companies for exploration and development, and mining companies have been awarded concessions for development of mineral deposits. At yearend 1967 three additional United States firms were conducting feasibility studies regarding substantial investments in Thailand's mineral industry. If these plans are realized, the required investments would far exceed any of those made previously in Thailand's mineral economy by United States firms.

One of the plans involves a joint United States-Thai investment by the International Minerals & Chemical Corp. and the Thai Oil Refining Company, Ltd. for the construction of a fertilizer plant at Sirracha. Byproducts of the Thai company's oil refinery would be used as feedstock for the fertilizer plant, and the project would necessitate an investment of $60 to $100 million. The jointly owned

[1] Industry economist, Division of International Activities.

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company would operate as Thai Agricultural Chemical Industries Company, Ltd.

The second proposal, also for a fertilizer plant, which envisions an investment of between $30 to $40 million, was submitted to the Thai Government by the U.S. firm, Allied Chemical Corp. Feedstock for this plant would be obtained from Iran's natural gas industry.

The third involves the U.S. firm, National Lead Co., which was awarded a concession to work zinc deposits located at Mae Sod in the northwestern province of Tak. If National Lead exercises its option, a large investment would be required, since one of the conditions is to build a smelter.

Italian, West German, Japanese, and Taiwan businessmen and government representatives are also interested in various development projects in Thailand. The West German Government encourages its citizens to invest in Thailand, and is providing $1 million for the establishment of a mining school in Songhla.

At the end of 1966 installed electric power generating capacity was approximately 400,000 kilowatts, and output during the year amounted to 1.6 billion kilowatt hours. In recent years Thailand's electricity requirements have been increasing by more than 25 percent per year. Demand for electric power by 1975 is projected to be over 9 billion kilowatt hours. Plans were approved in 1966 to proceed with the fourth stage of the Yan Hee power project, calling for the installation of the fifth and sixth 70,000-kilowatt generators at the Bhumipol (Yan Hee) dam by 1969; the installation of a third 87,500-kilowatt thermal generator at the North Bangkok powerplant by 1968; and construction of a third 230,000-volt transmission line from Yan Hee to Bangkok. Additional projects under construction at the end of 1967 included hydroelectric power stations at Ubol and Chaiyaphum in northeast Thailand. The International Bank for Reconstruction and Development has authorized a $26 million loan for the construction of the Phasom dam and powerplant on the Nan River in northwestern Thailand. In the construction stage was a 40-million-kilowatt thermal powerplant at Bang Pu, site of the Krabi lignite deposit in southern Thailand. Also, the government was considering the construction of a 400,000-kilowatt nuclear powerplant. A survey report on Thailand's electric power industry, under the auspices of the United States Operations Mission to Thailand, was transmitted to the Thai Government at the end of 1966.

PRODUCTION

Mineral output value in 1967 was approximately $130 million, about 50 percent tin and 30 percent cement. This was slightly higher than the total value in 1966 and roughly 20 percent more than the 1965 value. Comparing production in 1966 with that of 1965, substantial increases were noted in output of tin, cement, lignite, and gypsum. Tin prices were high in 1966, and large-scale tin smelting came into its own. Mine output of tin and iron ore showed little change in 1967, but cement production rose one-sixth and fluorspar production more than doubled. Tin prices reverted to lower levels in 1967, and more tin was locally smelted. Demand for cement was still increasing. The country's leading iron deposit had ore reserve problems. Outlook for manganese, lead-zinc, gypsum, and fluorspar, however, seemed promising. Thailand's two small oilfields in north Thailand continued production of small amounts of crude oil, and the country's three refineries operated at full capacity during 1967.

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Table 1.—Thailand: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Antimony:					
Ore	1,239	2,819	2,502	2,373	2,280
Mine e	613	1,269	1,130	1,068	1,026
Metal	105	258	173	213	129
Chromite	----	----	----	----	210
Columbite	----	----	----	----	46
Iron and steel:					
Iron ore 55 percent iron---thousand tons	16	191	750	692	549
Pig iron	6	5	5	2	6
Steel ingots and castings---do	3	4	7	5	3
Lead, mine	2,264	3,656	5,581	6,371	3,477
Manganese:					
Battery grade, 75 percent manganese dioxide	r 3,278	r 3,113	r 4,069	r 7,459	9,145
Metallurgical grade, 46–50 percent manganese dioxide	r 3,332	r 7,742	r 29,259	r 63,093	69,420
Chemical grade, 75 percent or more manganese dioxide	----	r 200	r 100	r 50	----
Monazite	NA	NA	NA	NA	NA
Tin:					
Ore and concentrate---long tons	21,276	21,288	r 26,003	r 30,806	30,702
Mine---do	15,585	r 15,597	19,047	22,565	22,489
Metal---do	----	----	5,522	r 16,990	26,582
Tungsten concentrate (65 percent tungsten trioxide)	190	397	r 512	r 517	858
Zinc, mine (in lead zinc ore)	855	1,380	2,110	2,400	----
Nonmetals:					
Barite	----	----	NA	NA	224
Cement---thousand tons	996	1,060	1,249	1,483	1,737
Fluorspar, 80 to 85 percent calcium fluoride	29,230	63,538	51,829	48,027	133,152
Gypsum	23,890	41,900	11,240	39,629	61,696
Marl (used for cement)---thousand tons	966	1,058	1,105	1,162	1,214
Salt, sea 85 to 90 percent sodium chloride thousand tons	266	190	188	e 200	e 110
Talc	NA	NA	NA	NA	NA
Mineral fuels:					
Coal, lignite---thousand tons	137	104	125	171	335
Petroleum:					
Crude---thousand 42-gallon barrels	45	45	40	40	e 45
Refinery products: [1]					
Gasoline---do	NA	NA	NA	[2] 3,785	3,214
Kerosine---do	NA	NA	NA	111	562
Jet fuel---do	NA	NA	NA	1,677	1,364
Distillate fuel oil---do	NA	NA	NA	e 4,707	4,987
Residual fuel oil---do	NA	NA	NA	4,242	3,910
Lubricating oil---do	NA	NA	NA	15	47
Asphalt---do	NA	NA	NA	440	767
Liquefied petroleum gas---do	NA	NA	NA	65	147
Other---do	NA	NA	NA	----	----
Total	NA	2,961	11,337	15,042	14,998

e Estimate. r Revised. NA Not available. p Preliminary.
[1] Thailand's first commercial refinery went on stream in late 1964.
[2] Includes naphtha.

TRADE

Thailand's balance of trade remained adverse in 1966 with the negative balance increasing to $474 million as compared with $150 million in 1965. During 1966 total exports increased by nearly 12 percent whereas imports increased by 51 percent. Since a large part of Thailand's imports are related to military requirements and were reimbursable from foreign accounts, the trade deficits have not had an adverse effect upon the country's foreign exchange reserve.

Mineral exports were valued at $87 million in 1966, an increase of 19 percent over that of 1965. Tin, accounting for 72 percent of the total was followed in importance by iron ore valued at $6 million. Further down the list were manganese ore and fluorspar valued at $1.5 and $1.4 million, respectively.

Data on the value of mineral trade and its relationship to total commodity trade

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for 1965 and 1966 are summarized in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	73	622	11.7
1966	p 87	694	12.4
Imports:			
1965	162	772	21.0
1966	226	1,168	19.3
Trade balance:			
1965	−89	−150	XX
1966	p −139	−474	XX

p Preliminary. XX Not applicable.

Imports of mineral commodities in 1966, as in previous years, were dominated by mineral fuels, $111 million, and semimanufactured iron and steel products, $70 million. Middle Eastern countries were the major sources of crude oil supplies, and Indonesia and Iran provided Thailand with most of her refined products. Japan accounted for $52 million, or 74 percent, of the country's imports of semimanufactured iron and steel products.

Table 2.—Thailand: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum, semimanufactures	----	7	All to Malaysia.
Antimony:			
Ore and concentrate	2,646	3,197	West Germany 1,933; Belgium 457; United Kingdom 340.
Metal	110	24	South Korea 18; United States 6.
Copper scrap	552	542	Japan 451; Taiwan 75.
Iron and steel:			
Iron ore thousand tons	723	720	All to Japan.
Scrap do	3,276	----	
Pig iron do	130	----	
Semimanufactures do	462	939	Laos 462; Kenya 428.
Lead ore and concentrate	10,534	12,405	Netherlands 9,083; Italy 2,130; West Germany 1,192.
Manganese ore	18,613	66,453	Japan 62,513; Taiwan 2,760; Hong Kong 925.
Tin:			
Ore and concentrate long tons	15,475	1,285	All to Japan.
Metal do	4,705	17,315	Bermuda 10,802; United States 4,100; Netherlands 1,200.
Tungsten ore and concentrate	209	817	West Germany 411; United Kingdom 170; Japan 134.
Zinc, all forms	35	93	All to Japan.
Nonmetals:			
Cement	r 79,742	45,423	Laos 32,623; South Viet-Nam 12,631.
Feldspar, fluorspar and cryolite	1 46,993	73,670	Japan 68,977; India 4,311.
Salt thousand tons	82	85	Malaysia 60; Singapore 21.
Slag and ash, nonmetal bearing	977	----	
Mineral fuels:			
Manufactured gas	----	33	Laos 28; Indonesia 5.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	r 270	57	Singapore 55.
Kerosine do	r 24	----	
Distillate fuel oil do	r 61	9	India 2; Taiwan 2.
Residual fuel oil do	r 784	1,284	Singapore 1,096; United States 70; Taiwan 54.
Lubricating oil do	r 2	19	India 18.
Total do	r 1,141	1,369	

r Revised.
1 Almost entirely fluorspar.

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Table 3.—Thailand: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum, metals and alloys:			
Scrap and waste	----	11	Laos 9.
Unwrought	1,836	3,915	Canada 1,514; United States 1,481.
Semimanufactures	3,279	2,804	Japan 1,375; West Germany 456; Taiwan 265.
Copper and alloys:			
Ores	291	----	
Scrap	69	76	United States 37; Laos 36.
Unwrought	361	455	United States 399; New Zealand 40.
Semimanufactures	3,609	3,625	Japan 2,697; United Kingdom 142; Australia 124.
Iron and steel:			
Iron ore and concentrate	----	2	All from Malaysia.
Scrap	5,445	4,365	United Kingdom 2,477; Hong Kong 1,000; Belgium 504.
Ferroalloys	1,016	NA	
Ingots and other primary forms	369	3,557	Taiwan 1,151; Australia 904; Republic of South Africa 665.
Semimanufactures	423,560	555,249	Japan 411,571; Hong Kong 46,222; United States 27,773.
Lead:			
Oxides	283	296	Australia 237; West Germany 21: Belgium 20.
Metals and alloys:			
Scrap and waste	----	3	All from Laos.
Unwrought	1,048	1,362	Australia 847; Burma 297; Hong Kong 106.
Semimanufactures	153	103	Japan 51; Australia 21.
Manganese:			
Ores	----	56	Republic of South Africa 46; Japan 10.
Oxides	1,516	1,099	Japan 918; United Kingdom 180.
Mercury—76-pound flasks	58	359	Japan 350; West Germany 5.
Nickel, all forms	126	353	Australia 200; United Kingdom 60; Japan 58.
Silver and alloys, all forms—thousand troy ounces	245	454	India 253; Hong Kong 167.
Tin and alloys, all forms—long tons	10	4	Denmark 2; Sweden 1.
Zinc:			
Scrap and waste	----	4	All from Singapore.
Oxides and peroxides	585	661	Netherlands 184; West Germany 142; France 124.
Metals and alloys:			
Unwrought	9,073	11,595	Australia 10,270; Canada 647; Japan 479.
Semimanufactures	1,672	2,534	Poland 1,644; Japan 503; Belgium 139.
Other nonferrous metals and alloys	141	285	Malaysia 138; United Kingdom 50; Netherlands 10.
Nonmetals:			
Asbestos, crude	8,358	16,595	Republic of South Africa 7,630; Cyprus 5,034; Canada 3,679.
Cement	39,113	262,993	Japan 205,741; Taiwan 49,950.
Clays and refractories:			
Crude clay not elsewhere specified	3,217	2,674	Japan 1,559; United Kingdom 418; Taiwan 250.
Clay construction materials:			
Refractory	3,983	4,196	Japan 1,678; West Germany 624; United Kingdom 468.
Nonrefractory	8,306	10,741	Japan 5,327; West Germany 2,293; Italy 849.
Feldspar, fluorspar, and nepheline syenite	344	385	Hong Kong 206; Japan 159.
Fertilizer materials, manufactured:			
Nitrogenous	33,357	51,029	West Germany 19,880; Japan 19,772; Belgium 4,290.
Phosphatic	r 4,993	49,439	Japan 41,153; United States 3,285; Netherlands 3,122.
Potassic	2,199	2,119	West Germany 875; France 800; United Kingdom 125.
Mixed	50,506	38,841	West Germany 14,565; Japan 8,655; Malaysia 7,080.
Ammonia, anhydrous	333	451	United Kingdom 147; Japan 130; Taiwan 108.
Graphite	479	438	Japan 246; Norway 62; Hong Kong 60.
Gypsum	161	149	Japan 143; Hong Kong 6.
Limestone, excluding dimension stone	915	274	Japan 268; United States 6.
Magnesite	131	91	United Kingdom 80; West Germany 6.
Pumice, emery, corundum and other natural abrasives	906	868	Netherlands 635; United Kingdom 112; United States 47.

See footnotes at end of table.

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Table 3.—Thailand: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Stone, sand, and gravel not elsewhere specified:			
Dimension stone:			
Crude	1,179	1,087	Laos 678; Hong Kong 301; Italy 93.
Worked	397	510	Italy 398; Laos 100.
Gravel and crushed stone	779	285	Laos 128; West Germany 80; France 32.
Sand, excluding metal bearing	1,660	318	Hong Kong 260; Japan 36; United Kingdom 10.
Grinding and polishing wheels and stones	399	444	Japan 154; United Kingdom 108; United States 81.
Sulfur:			
Elemental	5,210	11,172	United States 8,648; West Germany 691; Italy 615.
Sulfuric acid	----	22	Netherlands 12; Israel 2; United Kingdom 2.
Talc, soapstone and steatite	1,843	2,008	South Korea 1,500; Japan 232; India 157.
Other nonmetallic materials:			
Quartz, mica, cryolite and chiolite	365	448	Hong Kong 423; Japan 12.
Other not specified	1,944	1,658	Republic of South Africa 1,321; Australia 299.
Mineral fuels:			
Coal	1,377	1,357	United Kingdom 1,356.
Coke	3,651	4,219	Japan 1,386; Taiwan 1,010; Netherlands 784.
Carbon black	2,138	2,977	United States 1,458; Japan 581; West Germany 400.
Natural and manufactured gas	5	1,899	Indonesia 729; Singapore 630; Japan 354.
Petroleum:			
Crude—thousand 42-gallon barrels	8,862	16,071	Persian Gulf countries 8,832; Iran 5,023; United States 1,017.
Unfinished oils—do		58	All from Singapore.
Refined products:			
Gasoline—do	3,009	1,720	Indonesia 820; Singapore 292; Iran 242.
Kerosine—do		376	Indonesia 180; Iran 114; Malaysia 63.
Jet fuel—do		9,634	Indonesia 3,951; Iran 1,786; Persian Gulf countries 1,521.
Distillate fuel oils—do	2,800	3,685	Iran 1,648; Indonesia 720; Malaysia 358.
Residual fuel oils—do	1,368	1,027	Indonesia 778; Singapore 116; Japan 66; Malaysia 65.
Asphalt—do	62	35	Singapore 20; United States 8; United Kingdom 4.
Petrolatum and wax—do	32	44	Indonesia 25; Japan 5; Burma 4.
Other—do	76	578	United States 253; Singapore 242; Japan 38; Netherlands 16.
Total—do	8,824	17,099	
Tar and other crude chemicals from coal, oil, and gas distillation	1,320	695	Taiwan 602; United Kingdom 67.

e Estimate. r Revised.

Sources: Thailand Department of Customs and Statistical Office of the United Nations.

COMMODITY REVIEW

METALS

Antimony.—Output and exports of antimony ore declined slightly in 1966, and 1967 dropping below the 2,400-ton level. Virtually all of Thailand's antimony, including small tonnages smelted, is accounted for by one mine, located at Bansong in Surat, southern Thailand. Reserves of antimony ore have been estimated at 50,000 tons in the province of Surat Thani, 10,000 tons located in Lampang Province, 5,000 tons in Ratburi Province, and 1,000 tons in Prae Province.

Columbium-Tantalum.—Small quantities of columbite-tantalite concentrates were produced as byproducts of tin mining. Additionally, slag containing close to 30 percent combined columbium and tantalum oxides (50 to 60 percent tantalum oxides) has been recovered from tin smelting operations at Phuket for export to foreign treatment plants. Placer deposits of considerable potential importance have

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been discovered, with tin, on the headwaters of the Huai Klılong Pho River near Ban Rai in Nakhon Sawan Province, and west of Ratburi and Chom Bung in the Huai Bo Khlung area of Ratburi Province. Organized prospecting of these areas has been very limited. A West German field party was reported to have made a significant discovery of columbium and tantalum with little or no tin in the Chiengmai area of northwestern Thailand.

Copper.—A joint Thai-U.S. Geological Survey study financed by the United Nations has reported large deposits of iron and copper ore in the Loei-Chiengkarn area of northwestern Thailand. The deposits comprise about 27 million tons of varying grades of iron ore and 80 million tons of copper. The deposits grade from 0.8 to 1.0 percent copper, with additional lower grade ores present. The gold and silver content of the ores has not been evaluated for lack of assay facilities.

Iron Ore and Steel.—Over the past 3 years iron ore has become Thailand's third most valuable mineral product following tin and cement. Average yearly production has attained the 700,000-ton level, with most of the ore coming from three mines in Southern Thailand. The largest mine at Tha Sala, in Nakhon Sithamarat Province, was operated by the Thailand Steel Company, and a second mine in Nakhon Sawan Province, by the Eastern Mining and Development Company. All iron ore Produced by these two companies was exported to Japan. A third company, the Siam Cement Company with an iron mine in Lopburi Province, reduces the iron ore at a foundery near Sara Buri.

At yearend 1967 two small steel mills were under construction, and an existing mill was being expanded. A new company, Siam Iron and Steel Company, Ltd., was formed to erect a steel mill to utilize the ore from the Khao Thab Kwai field in Lopburi Province, central Thailand. On the basis of a survey by German experts, this field contains about 7 million tons of iron ore, which could be upgraded to 62 percent iron concentrate. The company's capital is $9 million; 80 percent of its shares are being offered to Thai investors, leaving 20 percent for foreign subscribers. The company will begin operations by taking over the iron foundry of the Siam Cement Company.

The second mill is a joint Japanese-Thai venture, which operates under the name of G. S. Steel Company, Ltd. The mill's capacity for round and deformed bars is about 120,000 tons per year, and construction was completed in February 1968. Two more arc furnaces were to be installed at the Bangkok Iron and Steel Works Company, one of Thailand's first iron smelters. Addition of these two furnaces will double the plant's capacity from 3,000 to 6,000 tons of bars per month. The company also plans to add one more 30-ton furnace in 1969, and still another in 1970.

Lead and Zinc.—Lead-zinc deposits occur in Thailand generally along the Burma border from Tak Province south to Ratburi Province. Current production, mainly lead, has been vitually all from the Kanchanaburi Province. In early 1966 the Government invited bids for mining rights and the establishment of a zinc smelting operation in three mining concession areas of Tak Province in northern Thailand, where ore reserves were estimated at 3.8 million tons averaging 25 to 35 percent zinc. In late 1967 the Ministry of National Development awarded the first concession to the U. S. firm, National Lead Co. This company was studying the advisability of exercising its option in early 1968. Under terms of the award the company would be required to build a 30-ton-per-day zinc smelter, and would have to build its own access roads and develop its own sources of power. Compliance with these requirements of the concession agreement would require a $15 to $20 million investment.

Manganese.—Most of Thailand's manganese ore comes from the Li district in Lamphun, north Thailand. In recent years government geologists have investigated newly discovered deposits. These include deposits in Chieng Rai with a reserve of not less than 150,000 tons; two in Lampang with a reserve of 2 million tons; and one low-grade deposit in the Ngao district with reserves of not less than 200,000 tons. Production of both battery-grade and metallurgical-grade manganese ore has risen markedly in the last 3 years.

Tin.—Thailand Smelting and Refining Company, Ltd. (Thaisarco, controlled by Union Carbide Corporation) expanded the

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capacity of its Phuket smelter to 40,000 tons of concentrate per year by the addition of a fourth furnace during 1967. By this addition Thailand's smelter capacity became considerably larger than the mine tin output. In fact, during the latter half of 1967, there was a chance to reline two of the furnaces and still treat the available concentrate supply. The country's stocks of untreated ore, which had increased to 7,000 tons during 1966, were down to 3,200 tons by early 1967. For 1967 as a whole, the total value of Thaisarco's smelter output was about $86.6 million.

According to local press reports, tin had been discovered in commercial quantities in northern Thailand near the Burmese border. The discovery is attributed to the activities of the Mineral Resources Survey Center established with West German assistance. Southern tin miners were reportedly interested in obtaining concessions in this area, but development will not be possible until transportation facilities are provided. Additionally, offshore exploration has revealed excellent potential tin deposits off the west shore of the Thailand Peninsula.

The largest recent offshore exploration for tin is the joint venture of Union Carbide and the Eastern Mining Corporation which had both onshore and offshore concessions in the provinces of Ranong, Panga, Phuket, and Sorathani. The companies have reported substantial finds which verify the fact that offshore tin offers fine prospects in the southern peninsula area. The Government, as of the end of 1967, had granted 34 offshore tin concessions to four companies—names not specified in source—covering areas in the bays of Phuket and Takua Pa amounting to over 14 square kilometers.

As in past years, the United States was Thailand's major tin customer. Preliminary trade data for 1967 indicate that the United States received 67 percent of Thailand's 1967 tin exports. Netherlands, the second most important recipient received 25 percent.

Tungsten.—Thailand accounted for about 1 percent of the world's tungsten production in 1967. Over 90 percent of the output is a byproduct of tin mining. The ore is recovered in the forms of wolframite and scheelite.

NONMETALS

Barite.—During 1966 and 1967 sizable deposits of barite were found in Lamphun, north Thailand, and in Loei, northeastern Thailand, with reserves totaling about 2 million tons. Additional deposits have also been discovered in the south. One mine in Nakhon Si Thammarat province reportedly had substantial outcroppings of high-grade ore. So far, only small amounts of barite have been produced in the country, since large-scale exploitition was clearly dependent upon obtaining necessary capital and technical help.

Cement.—The Siam Cement Company, which accounted for over 85 percent of Thailand's cement production in 1967, was increasing the combined capacity of various plants from 950,000 tons per year to 2 million tons per year. The expansion program was expected to be completed by 1968, and with this additional capacity, Thailand should be self-sufficient in cement. All the necessary equipment was ordered from Denmark.

During August 1967, prices of cement in the local market dropped to a more normal level of $22.17 (Baht 460) per ton. At one time cement prices had been as high as $38.55 (Baht 800) per ton, due mainly to a cement shortage and hoarding on the part of speculators. Some of the factors causing the lower price were the Government's release of stockpiled cement, increased imports, and the startup of the new Thung Sang plant in southern Thailand, one of the plants owned by the Siam Cement Company.

Fertilizer Materials.—Thailand's first chemical fertilizer plant, owned by the Chemical Fertilizer Co. (Chemferco), was fully operational in 1967, and capable of manufacturing 60,000 tons of ammonium sulfate and 35,000 tons of urea per month. Located at Mae Moh, northern Thailand, this plant used lignite as a raw material. Completed in 1966, it had not been operating at full scale prior to 1967 because of sulfur shortages.

The Thai Oil Refinery Company, Ltd. and The International Minerals and Chemical Corp. (United States) were considering jointly building a fertilizer plant at Srirach, utilizing byproducts from the refinery as feedstocks. Allied Chemical Corp. (United States) was also conducting

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feasibility studies regarding the construction of still another fertilizer plant.

Fluorspar.—A Thai-United States company, Research and Resources Co., Ltd., of Bangkok, announced the discovery of fluorspar deposits in Petchaburi Province that may contain 20 million tons. Exploitation commenced during 1967, when about 10,000 tons were extracted. The company expects production in 1968 to be at least 50,000 tons, virtually equivalent to the entire Thai fluorspar production of 48,027 tons in 1966. By 1969 the firm predicts it will be producing at the rate of 10,000 tons per month.

Thailand's fluorspar output more than doubled in 1967, topping 100,000 tons by a sizable margin. During the year, six other companies which were operating 18 mines in August 1967 were producing fluorspar. Some of the producing companies were as follows: Siam Ores Co., Ltd.; Nal Preecha Eophantong; Ploi On, Ltd.; Nai Tong Soak Priyatrit; Universal Mining Co., Ltd.; and the joint operations of Thai Fluorspar and Ban Hong Minerals Co., Ltd.

Gypsum.—Substantially increased production has enabled Thailand to become self-sufficient in gypsum. In the latter months of 1966, primarily because of the opening of two new mines during the year, Thailand's production was sufficient to permit the export of about 2,500 tons of high-grade gypsum to Malaysia. In 1967 it is expected that exports to Malaysia will amount to at least 14,000 tons. Most of the exports are from the Thai Gypsum Company, Ltd.'s mine located at Surat, south Thailand.

Salt.—Unrefined salt produced from seawater continued to be Thailand's only source of salt, and annual output has averaged more than 200,000 tons. Large rock salt deposits occur in several areas in the northeast region of Thailand, however, the required capital to develop these deposits has not been forthcoming.

MINERAL FUELS

Lignite.—Thailand has 16 known lignite deposits in 8 provinces, but only two have significant reserves. The Mae Moh lignite deposit, with a reserve of 120 million tons in mined by the Lignite Thermal Power Organization for its thermal-electric generating plant, and the deposit at Krabi, with estimated reserves of 100 million tons, also supplies lignite to a thermal powerplant. The present requirements of the Mae Moh thermal powerplant and fertilizer plant are approximately 600 long tons of lignite per day. The addition of a 75-million-watt thermal unit to the powerplant will increase daily requirements to 1,500 tons, which is the capacity of the present mining equipment on a two-shift basis. Based on present and programed uses of lignite, reserves at Mae Moh will be exhausted in 200 years. The reserves at Krabi will all be used by the mine site thermal plant in approximately 20 years unless additional reserves are discovered. Recently another large lignite deposit was discovered Amphoe Li in Lampang Province, north Thailand, with reserves estimated to be in excess of 20 million tons.

Petroleum.—As a part of the general movement to encourage mineral and industrial projects, Thailand passed an oil law in 1967 entitled "Consideration Bases in Applying for Petroleum Exploitation and or Production." On the basis of this new legislation, the Government invited bids for offshore acreages in the Gulf of Siam. Concessions were awarded to six oil companies, which included five U.S. firms—Gulf Oil Corp., Union Oil Company, Tenneco, Inc., Continental Oil Co., and American Oil Company—and one British company, British Petroleum Company, Ltd. The Gulf Oil Corp. and Union Oil Company had been previously awarded onshore concessions. Gulf's concession is in the area between Bangkok and the Gulf of Siam, and Union's tract is the Korat Plateau area of northeastern Thailand.

During 1967 plans for the expansion of the country's refining capacity were practically complete. The state-owned refinery at Farng was to be expanded to handle additional production from the newly discovered reserves in north Thailand; the Thai Oil Refining Company was planning an expansion of their refinery at Sriracha from 40,000 barrels per day to 65,000 barrels per day; and Standard Oil Co. of New Jersey, which recently purchased a 7,000-barrel-per-day asphalt plant, planned to convert the plant into a 35,000-per-day refinery.

Shale.—The Japan Oil Shale Developmants Company proposed to reactivate an oil-shale development project in Thailand,

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possibly in connection with United States interests. Thailand has two known deposits of oil shale—one at Mae Sod and the other at Li, Lamphun Province. Reserves at Mae Sod were estimated on a preliminary basis at 190 million tons, and those at Li, 15 million tons. Shale oil yield is estimated at 67 U.S. gallons of oil per ton for Mae Sod shale and only 15 U.S. gallons per ton for Li shale.

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The Mineral Industry of Tunisia

By Walter C. Woodmansee [1]

The most significant development in the Tunisian mineral industry in 1967 was progress in the operation of the oilfield at El Borma and the steelworks near Menzel Bourguiba, both inaugurated in 1966. The phosphate sector, including phosphate rock mining and phosphatic fertilizer manufacture, remained predominant in the industry despite marketing problems.

Few data are available on the value of mineral industry output in 1967, but based on 1966 performance the industry apparently contributed 10 to 15 percent of the $957 million gross national product.[2] [3] Tunisian mines employed about 14,300 workers in 1967, including 10,000 phosphate mine employees. In July, the fertilizer industry employed 669 persons, and the Menzel Bourguiba steelworks 520.[4]

In December the U.S. Agency for International Development provided a $600,000 loan for continued ground-water development in Tunisia. This program would extend a completed technical assistance project of Ralph Parsons and Co., Los Angeles, Calif. Efforts were directed toward the training of Tunisians in well maintenance and utilization, equipment maintenance, and field management.

A United Nations Special Fund minerals project in Foussana Basin, completed in 1967, resulted in the discovery of commercial lead-zinc deposits. The United Nations financed $1 million of the $1.4 million project.

PRODUCTION

There were no major production shifts during 1967. Reductions appeared in output of phosphate rock, the most important product of the minerals sector, cement, iron ore, and lead-zinc ores. Notable advances were made in crude oil, petroleum refinery products, silver, superphosphate, and pig iron.

[1] Physical scientist, Division of International Activities.

[2] Preliminary estimate of the Central Bank, Secretariat of Plans and National Economy.

[3] Where necessary, values have been converted from Tunisian dinars (TD) at the rate of TD1 equals US$1.905.

[4] Industries et Travaux d'Outremer, No. 170, January 1968, p. 55.

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Table 1.—Tunisia: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Iron and steel:					
Iron ore—thousand tons	865	939	1,117	r 1,269	918
Pig iron—do	------	------	------	e 50	98
Ingots and other primary forms, mainly billets—thousand tons	------	------	------	e 45	e 45
Semimanufactures—do	------	------	------	e 40	e 50
Lead:					
Concentrate, metal content	14,240	12,650	15,870	15,931	12,447
Smelter	12,608	12,094	r 15,428	r 15,312	13,245
Antimonial	2,833	846	1,250	1,339	355
Mercury—76-pound flasks	------	87	174	254	292
Silver—troy ounces	9,581	12,635	33,758	38,002	44,722
Zinc concentrate, metal content	4,363	3,339	4,737	5,794	4,152
Nonmetals:					
Cement—thousand tons	361	455	454	478	472
Clay, construction—do	40	44	r e 100	r e 200	220
Fertilizer materials:					
Natural: Phosphate rock—do	2,371	2,751	3,040	r 3,216	2,810
Manufactured:					
Hyperphosphate—do	86	101	110	65	6
Triple superphosphate—do	NA	e 152	e 248	r 271	324
Fluorspar	------	------	r e 3,000	r 2,625	e 2,500
Gypsum—thousand tons	18	e 18	e 18	e 18	e 10
Lime—do	133	175	174	172	170
Salt (sales)—do	308	214	356	328	e 300
Mineral fuels:					
Gas:					
Gashouse—million cubic feet	561	506	NA	NA	NA
Natural, marketed—do	272	293	301	312	328
Petroleum:					
Crude—thousand 42-gallon barrels	------	------	------	4,741	17,068
Refinery products:					
Gasoline, including naphtha—do	------	785	964	1,037	1,258
Kerosine—do	------	327	398	393	434
Distillate fuel oil—do	------	1,311	1,616	1,639	1,832
Residual fuel oil—do	------	1,696	2,055	2,501	2,239
Liquefied petroleum gas—do	--------	69	97	128	172
Total—do	------	4,188	5,130	5,698	5,935

e Estimate. r Revised. NA Not available.

[1] In addition to commodities listed, construction materials such as sand, gravel, and quarried stone also are produced, but quantitative data are not available.

TRADE

The mineral industry continued to contribute a large share of total export earnings and showed a favorable trade balance. However, the total trade balance remained heavily in deficit in 1966. Authorities planned to improve this unfavorable trade balance by increasing petroleum exports, particularly crude oil.

Principal mineral commodity exports in 1966, in terms of value, were as follows (1965 values given parenthetically): Phosphate rock, $24.98 million ($23.8 million); phosphatic fertilizers, $10.0 million ($16.4 million); crude petroleum, $8.04 million (none in 1965); iron ore, $5.5 million ($5.8 million); and smelter lead, $3.4 million ($4.6 million). Principal mineral commodity imports follow: Iron

	Value (million dollars)		Mineral commodities share of total (percent)
	Mineral commodities [1]	All commodities	
Exports:			
1965	53.6	119.8	44.6
1966	56.7	140.4	40.4
Imports:			
1965	44.8	245.0	18.3
1966	50.6	249.0	20.3
Trade balance:			
1965	+8.8	−125.2	XX
1966	+6.1	−108.6	XX

XX Not applicable.

[1] Includes only those commodities listed in tables 2 and 3 of this chapter.

Source: Statistical Office of the United Nations, New York.

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and steel, $20.0 million ($21.05 million); crude petroleum, $9.7 million ($9.7 million); sulfur, $5.7 million ($2.6 million); petroleum refinery products, $3.6 million ($2.8 million); and manufactured fertilizers, mainly nitrogenous, $1.6 million ($1.2 million).

Table 2.—Tunisia: Exports of major mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum and alloys, unwrought	229	186	West Germany 96; Italy 86.
Copper and alloys, all forms, mainly scrap.	645	983	Belgium-Luxembourg 354; France 331; Italy 233.
Iron and steel:			
Ore—thousand tons	910	876	Italy 302; United Kingdom 213; Greece 202.
Scrap	8,021	5,263	Yugoslavia 2,524; Italy 1,633.
Pig iron and ferroalloys	5	15,928	Belgium-Luxembourg 5,630; Sweden 5,154; United Kingdom 5,144.
Ingots and other primary forms	------	750	All to Belgium-Luxembourg.
Semimanufactures	122	75	Mainly to European Economic Community.
Lead:			
Concentrate	5	136	All to France.
Unwrought	14,302	13,002	France 4,016; Czechoslovakia 2,674; Poland 2,500.
Mercury—76-pound flasks	179	29,055	Belgium-Luxembourg 29,023.
Silver and alloys, troy ounces unworked or partly worked, including scrap.	32	23,663	All to France.
Zinc, concentrate	2,166	10,980	France 3,737; Spain 3,100; East Germany 2,491.
Ore and concentrate, nonferrous, n.e.s	3,434	889	France 539; Poland 350.
Scrap, nonferrous, n.e.s	79	28	All to Italy.
Nonmetals:			
Cement	33,130	------	
Clay construction materials, brick, tile, etc.	2,080	17,557	Libya 17,555.
Feldspar and fluorspar	3,594	2,908	Italy 2,907.
Fertilizer materials:			
Natural: Phosphate rock thousand tons	2,376	2,400	France 584; Italy 326; Greece 263; Yugoslavia 254.
Manufactured:			
Phosphatic—do	257	169	Bulgaria 39; France 20; Turkey 19; Sweden 18.
Other	538	1,139	All to Malagasy Republic.
Gypsum and anhydrite	750	------	
Salt—thousand tons	378	276	United States 125; Japan 78; Finland 25.
Stone, dimension, worked	35	561	Libya 557.
Mineral fuels:			
Petroleum:			
Crude—thousand 42-gallon barrels	------	4,745	West Germany 3,535; Italy 1,110.
Refinery products:			
Gasoline and jet fuel—do	154	661	Italy 447; bunkers 214.
Distillate fuel oil—do	105	84	All to bunkers.
Residual fuel oil—do	89	67	Do.
Total—do	348	812	
Mineral tar and crude chemicals from coal, oil and gas distillation.	33	------	

Principal source: Statistical Office of the United Nations, New York.

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Table 3.—Tunisia: Imports of major mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals: [1]			
Aluminum:			
Alumina	-----	121	France 120.
Metal	536	416	Spain 146; France 115; United States 77.
Copper	535	547	France 321; United States 142.
Gold—thousand troy ounces	29	26	All from France.
Iron and steel:			
Scrap	106	115	France 45; Belgium-Luxembourg 23.
Pig iron and ferralloys	1,186	726	Switzerland 492; France 207.
Ingots and other primary forms	3,499	9,996	West Germany 4,000; U.S.S.R. 3,000; Belgium-Luxembourg 2,996.
Semimanufactures:			
Angles, shapes, and sections	77,129	46,113	United States 14,506; U.S.S.R. 8,193; Czechoslovakia 5,573; West Germany 3,717.
Plate and sheet	13,350	12,168	West Germany 5,003; France 4,975; Italy 1,308.
Hoop and strip	1,249	806	France 409; Italy 209.
Rails and accessories	6,188	16,176	France 16,071.
Wire	3,931	3,800	Belgium-Luxembourg 1,503; France 1,497.
Tubes, pipes, and fittings	17,226	26,873	Italy 11,062; France 6,592; Yugoslavia 6,482.
Castings and forgings	2,557	2,883	France 2,467.
Total	121,630	108,819	
Lead	68	149	France 125.
Mercury—76-pound flasks	3	40	Mexico 35.
Nickel	7	11	West Germany 6; France 3.
Silver—troy ounces	31,154	17,072	West Germany 6,109; France 5,498.
Tin—long tons	37	31	France 21; Netherlands 6.
Zinc	205	159	France 131.
Ore and concentrate, metallic, mainly nonferrous.	-----	165	France 161.
Oxides, metallic, mainly for paint	718	788	France 350; West Germany 246.
Metals, nonferrous, n.e.s	25	30	Mainland China 25.
Nonmetals:			
Abrasive materials:			
Grinding stones and wheels	33	74	France 24; West Germany 20; Poland 18.
Natural, n.e.s., mainly pumice	------	263	Italy 257.
Asbestos, crude and partly worked	406	2,981	United Kingdom 1,004; Canada 916; Italy 601.
Barite	10,170	1,191	Italy 800; France 391.
Cement, including asbestos-cement	13,838	13,577	France 8,532; Algeria 2,078.
Chalk	80	90	All from France.
Clay construction materials:			
Clay	4,388	4,348	Morocco 1,459; Italy 1,385; Algeria 629.
Bricks, tiles, setts, etc	3,912	5,398	Czechoslovakia 1,490; Spain 1,374; France 1,364.
Diatomite	108	67	France 29; United States 23.
Dolomite	206	282	Norway 119; France 111.
Feldspar and fluorspar	------	251	Italy 250.
Fertilizer materials: Manufactured:			
Nitrogenous	16,513	20,132	France 14,253; West Germany 5,086.
Potassic	1,750	3,547	Belgium-Luxembourg 1,492; East Germany 1,104; West Germany 950.
Other	110	------	
Ammonia	503	543	Italy 479.
Gemstones, precious and semiprecious—kilograms	2	2	All from France.
Graphite	13	10	Do.
Gravel and crushed stone	263	384	Italy 351; France 33.
Gypsum	305	400	France 398.
Magnesite	40	55	Austria 42; West Germany 13.
Mica, unworked and worked	137	9	France 6; Bulgaria 3.
Potash, caustic	115	36	All from France.
Quartz and quartzite	182	375	Do.
Refractory materials, bricks, tiles, etc	4,302	6,521	West Germany 2,200; Morocco 1,271; Austria 1,174.
Soda, caustic	3,222	3,820	France 3,462.
Stone, dimension	2,852	1,371	Italy 1,366.
Sulfur in all forms:			
Natural	74,168	128,950	United States 71,618; Mexico 30,174; Canada 16,413.
Refined	900	1,300	All from France.
Sulfur dioxide	113	126	Do.
Sulfuric acid	1,005	5,745	Italy 5,659.
Pyrite, unroasted	3,787	7,983	All from Spain.

See footnotes at end of table.

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Table 3.—Tunisia: Imports of major mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals:—Continued			
Talc and steatite	337	350	France 345.
Minerals, nonmetallic, n.e.s.	70	4,353	All from Italy.
Elements and compounds, nonmetallic, n.e.s.	400	270	Algeria 101; Italy 78; France 71.
Manufactures, nonmetallic, n.e.s.	5,967	290	France 144.
Mineral fuels:			
Coal	30,535	29,614	U.S.S.R. 21,633; Poland 7,978.
Coke	21,002	55,867	Netherlands 25,728; United States 18,222; France 8,714.
Petroleum:			
Crude—thousand 42-gallon barrels	5,050	5,405	Iran 3,401; Kuwait 1,578.
Refinery products:			
Gasoline—do	15	12	Netherlands Antilles 7.
Kerosine—do	21	34	Netherlands Antilles 19; France 10.
Distillate fuel oil—do	15	------	
Residual fuel oil—do	------	22	All from Italy.
Lubricants—do	78	97	France 46; United States 43.
Asphalt and bitumen—do	113	99	Italy 87.
Other—do	4	3	Algeria 1; France 1; West Germany 1.
Total—do	246	267	
Mineral tar and crude chemicals from coal, oil and gas distillation.	80	NA	

NA Not available.
[1] Unwrought and semimanufactures, including alloys, unless otherwise specified.
Principal source: Statistical Office of the United Nations, New York.

COMMODITY REVIEW

METALS

Iron and Steel.—Expansion was underway at the Djebel Djerissa and Tamera-Douaria iron ore mines, where a total annual output rate of 1.3 million tons of ore is planned for 1968.

The new iron and steel works of the Government-owned and-operated Société Tunisienne de Sidérurgie El-Fouladh, 2 kilometers east of Menzel Bourguiba, was officially opened on June 4, 1966. Plant equipment was financed by credits from France, Sweden, and the United Kingdom. W. S. Atkins and Partners, a United Kingdom firm, was consulting engineer for the project. Installations include a sinter plant, a blast furnace with a maximum annual capacity of 120,000 tons, two 12-ton Linz-Donawitz converters with oxygen injection, continuous casting equipment, and an 80,000-ton-per-year rolling mill for billets, rods, bars, wire, and small sections.

The blast furnace was closed down during the summer for cleaning and removal of scale. Research was underway to determine the usability of the relatively low grade ore (40 to 50 percent iron), which contains problem-causing impurities.

Lead and Zinc.—A United Nations Special Fund exploration project in Foussana Basin, north of Kasserine, resulted in discovery of sizable lead–zinc deposits at Djebel Azered and Djebel Hamra. A pilot washing plant was installed. A favorable geophysical survey in the north, between Bizerte and the Algerian border, may lead to further exploration.

In May an agreement was signed for a new company, Peñarroya-Tunisie, owned equally by Société Minière et Métallurgique de Peñarroya, a French firm, and Société Tunisienne d'Expansion Minière, a firm formed in 1965 by merger of seven Tunisian lead-zinc mining companies. Peñarroya-Tunisie planned development of a zinc ore deposit near Ghardimaou in the northwest.

Uranium.—In 1966, the Tunisian Atomic Energy Commission planned to build a pilot uranium mill for treating 0.05 percent U_3O_8 ore from a large deposit discovered in 1965 and byproduct uranium from phosphate rock containing 0.01 percent U_3O_8. The United Kingdom Atomic Energy Authority assisted in the

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project. No further details were available in 1967.

NONMETALS

Barite.—Byproduct barite output was planned at the Hamman Zriba flourspar mine. The planned annual production of 35,000 tons of barite concentrate will be separated by jigs and shaking tables.

Fertilizer Materials.—*Nitrogenous.*—A $30 million fertilizer complex was under construction at Gabes for Industries Chimiques Maghrébines S.A. The facilities were designed by a Belgian firm, Société Belge de l'Azote et des Produits Chimiques du Marly, and constructed by Compagnia Technica Industria Petroli, Rome, Italy. Annual capacity was reported at 40,000 tons of nitric acid, 65,000 tons of ammonia, 80,000 tons of ammonium nitrate, and 200,000 tons of ammonium phosphate.

Phosphatic.—Output of phosphate rock was lower in 1967, mainly owing to foreign marketing problems during 1966 and the first half of 1967. Stiffer competition for European and Far Eastern markets forced world prices downward. Tunisia considered establishing lower prices and adding beneficiation facilities to improve the relatively low quality of the product. Stocks remained high until late in the year, especially for the lower grades.

In June, India and Tunisia signed an agreement involving 300,000 tons of phosphate rock and fertilizer for delivery to India by March 1968. The agreement affirmed the delivery of 150,000 tons, leaving India on option on the remainder.

In April a new phosphate beneficiation plant, financed by Polish credits repayable in deliveries of phosphate rock, was inaugurated at Metlaoui.

The downward trend in production and export of hyperphosphate that started in 1966 continued in 1967, because of reduced orders by South Viet-Nam and limited world demand.

Output of triple superphosphate continued upward in spite of marketing problems. More producers entering world markets caused greater competition, and shortages of sulfur led to increased world prices and temporary shutdowns by producers in Tunisia.

Fluorspar.—Production, which began in 1965, continued at Djebel Ouest and Djebel Staa. The product was exported to Italy where fluorspar was used as a semiprecious stone in jewelry.

The Hamman Zriba mine, located 70 kilometers south of Tunis, where a 5–million–ton deposit containing 32 percent calcium fluoride and 50 percent barite-celestite was discovered in 1966, was in production by late 1967. Annual production of 25,000 tons of acid-grade fluorspar was planned. The fluorspar is concentrated at a flotation plant for 30 tons of ore per day, and the concentrate is trucked to the port at La Goulette.

MINERAL FUELS

Petroleum.—The El Borma field of Société Italo-Tunisienne d'Exploitation Pétrolière (SITEP) completed its first full year of operation. The company, an equal-partner venture of the Tunisian Government and the Italian firm, Ente Nazionale Idrocarburi (ENI), started production in June 1966 from Triassic strata at depths of 8,250 to 8,910 feet. Reserves were reported to exceed 460 million barrels. ENI has a contract for 4.5 million tons (about 35 million barrels) over a 2½ year period starting in 1967.

The El Borma oil structure extends into Algeria, where the first well drilled on the structure reportedly also struck oil. The two countries reached an agreement delineating borders and dividing production rights. A 14–inch, 80-kilometer, 40,000-barrel-per-day pipeline spur was built from the El Borma field to the Algerian Compagnie des Transports par Pipe-Lines au Sahara (TRAPSA) line, which terminates at La Skhirra. ENI planned to construct its own line from the field directly to the La Skhirra terminal.

SITEP completed a seismic survey and exploratory drilling in the northern part of its El Borma permit. Later in the year drilling was started in the southern permit area, south and east of El Borma.

A smaller oil discovery in 1966 at Djebel Doulab, north of Kasserine, was being readied for production in 1968 at a planned rate of 3,000 to 4,000 barrels daily. Reported reserves were about 15 million barrels. The field is controlled by Société de Recherches et d'Exploitation des Pétroles en Tunisie (SEREPT) (30-percent interest) and Société Aquitaine-Tunisie (70-percent interest); the latter firm was formed by a French company, Société Nationale de Pétroles Aquitaines

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and the Tunisian Government. Late in the year, there were five wells producing from depths of about 3,000 feet. Aquitaine-Tunisie planned a 6-inch, 160-kilometer pipeline to the La Skhirra terminal.

Late in 1967, SEREPT received a new concession for part of the Gulf of Gabes, east of an existing Aquitaine Tunisie concession. French-Tunisian interests controlled a total of 11,472 square kilometers in the gulf.

Early in the year, Global Marine Inc., Los Angeles, Calif., was drilling from its Glomar V offshore rig in the Gulf of Gabes. In May, the Glomar V was moved to the Gulf of Hammamet, 20 kilometers east of the city of Hammamet, in a French Société de Participations Pétrolières (PETROPAR)-SEREPT concession of more than 2 million acres.

Amerada Petroleum Corp., partners with Continental Oil Co. and Marathon Oil Co., the only U.S. interests in oil exploration in Tunisia during the year, continued drilling in its concession in the south, near the Algerian border. The well, apparently unsuccessful, was bottomed at more than 11,000 feet.

The Bizerte refinery of Société Tuniso-Italienne de Raffinage (STIR), which comprises Tunisian Government and ENI interests on a 50–50 basis, continued to expand output. Annual capacity is 7 to 8 million barrels. The refinery was built to process heavy crudes from the Persian Gulf. With closure of the Suez Canal and new output from El Borma, the refinery was adapted to the use of the lighter El Borma crude (44° API gravity). Throughput of this crude oil was 350,000 tons (about 2.7 million barrels) in 1967 and, late in the year, the refinery processed El Borma crude almost exclusively.

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The Mineral Industry of Turkey

By E. Shekarchi [1]

The mineral industry of Turkey continued to make a significant contribution to that nation's economy during 1966 and 1967. The gross value of mineral and metal production in 1966 increased 26.7 percent over that of 1965 to $465 million,[2] equal to 5.2 percent of the gross national product (GNP) of approximately $8.9 billion. Value of exports in 1966 reached a record high of approximately $54.6 million, mainly because of high market prices for blister copper. With production of more than 500,000 tons of chromite of all grades, Turkey contributed at least 15 percent to total world production and ranked third among the world's chromite producing countries.

In estimates made by the U.S. Agency for International Development (AID) in 1967, the population of Turkey was reported to be about 32.7 million, with an annual increase of 2.5 percent. Labor distribution remained the same as in 1966 with 75 percent engaged in agriculture and 25 percent employed in the industrial sector. Based on 1966 dollar values, GNP per capita was $306 in 1967, 3.4 percent over that of 1966.

An annual GNP growth rate of 6.7 per cent was achieved during Turkey's first 5-year plan (1962–67). On this solid foundation, the second 5-year plan, to be launched January 1, 1968, calls for a 7-percent annual increase in GNP through an investment program emphasizing production of intermediate industrial goods. The industrial sector should grow by 12 percent each year; agriculture, which currently comprises 30 percent of GNP, by 4.1 percent; and services by 6.2 percent. The total investment called for during the 5-year period is $12.4 billion, with industry to account for 34 percent, agriculture 15.2 percent, and transportation 16.1 percent.

Although consideration was still being given to changes in the mining law, no revisions had been agreed upon by the administration of parlimentary group at yearend 1967. Furthermore, efforts to form a mining development bank to assume and extend the loan facilities now available under the Mining Assistance Commission have not been successful.

Maden Tetkik ve Arama Enstitüsü (MTA), the Minerals Research and Exploration Institute, which has moved to its new headquarters near the Middle East Technical University in Ankara, diversified its exploration program to cover such commodities as lignite, iron ore, petroleum, lead, zinc, copper, uranium, and mercury. A major 1967 discovery by the exploration groups directed by MTA and assisted by five West German geologists was a lignite bed, 40 meters thick and with estimated reserves of about 880 million metric tons, located in Maraş Province.

The geological mapping program by the MTA progressed satisfactorily and a geological map at 1:125,000 for most of the country is now available.

Under the terms of an international project credit agreement signed between the U.S.S.R. and the Government of Turkey in 1967, the Soviet Government provided $200 million to finance a 1-million-metric-ton-per-year steel mill and a 60,000-metric-ton annual capacity aluminum plant to be built in Izmir and Seydişehir, respectively. The agreement also provided that a 3-million-ton-per-year petroleum refinery is to be built in Izmir. Repayment of the loan is to be made in Turkish agricultural products.

[1] Foreign minerals specialist, Division of International Activities.

[2] Where necessary, values have been converted from Turkish lira (TL) to U.S. dollars at the rate of TL1=US$0.11.

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PRODUCTION

The gross value of mineral production in 1966, including metals, nonmetals, and mineral fuels, increased about 28.7 percent over the 1965 level. The most impressive gains in value of production were made in basic industrial products: Blister copper increased 54.4 percent; steel ingot was up 40 percent; and cement increased about 26 percent. However, it should be noted that prices for practically all minerals and

Table 1.—Turkey: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Aluminum: Bauxite	-------	4,469	10,283	r 32,380	21,490
Antimony: [2]					
Ore and concentrate	3,030	3,294	3,534	3,081	2,035
Regulus	48	58	107	130	55
Chromite (all grades)	283,738	412,685	567,062	511,645	e 530,000
Copper:					
Mine production (contained metal)	29,200	34,500	33,600	36,400	30,988
Blister from other domestic ore	24,790	25,981	26,300	26,617	25,390
Ferrochromium	NA	4,821	7,473	7,000	8,471
Iron and steel:					
Iron ore—thousand tons	747	976	1,530	1,620	1,485
Pig iron and blast furnace ferroalloys—thousand tons	394	401	500	822	847
Steel ingots—do	388	486	666	939	1,056
Lead:					
Content of concentrate	2,550	1,626	1,682	935	2,358
Metal	1,881	1,960	918	500	NA
Manganese ore	6,304	20,290	14,220	r 22,268	e 17,000
Mercury—76-pound flasks	3,042	2,615	2,755	r 3,420	4,100
Zinc:					
Zinc-lead ore, hand-sorted	4,500	12,500	16,548	16,620	18,448
Zinc ore, calcined	4,000	8,950	8,500	7,150	NA
Zinc concentrate	1,867	1,858	1,758	1,768	1,342
Zinc content of ore and concentrate	4,576	5,686	7,000	r 3,420	NA
Nonmetals:					
Asbestos	370	1,171	1,248	1,141	2,196
Barite	981	6,050	11,980	r 18,680	31,590
Boron minerals	88,088	128,254	170,977	225,286	287,607
Cement—thousand tons	2,698	2,940	3,328	3,865	4,249
Clay, including fire clay—do	13,000	e 13,000	e 13,500	r 19,000	NA
Emery	7,490	12,400	12,579	29,470	31,125
Fertilizer (chemical)	322,257	300,930	r 376,800	r 373,526	359,804
Fluorspar	652	1,303	1,077	1,505	NA
Gypsum	180,000	e 200,000	e 220,000	e 220,000	NA
Magnesite (crude ore)	17,917	39,068	75,587	r 97,000	84,959
Marble e—cubic meters	10,000	15,000	15,000	r 19,000	NA
Meerschaum—kilograms	10,500	24,100	99,400	57,200	67,510
Pyrite, cupreous (gross weight)	97,082	113,093	133,159	120,622	125,000
Salt, all types—thousand tons	398	355	493	r 300	NA
Sodium sulfate	1,264	2,425	4,963	7,423	11,289
Sulfur	19,430	22,200	22,299	22,650	25,384
Mineral fuels:					
Bituminous coal (salable)—thousand tons	4,156	4,448	4,401	r 4,893	5,031
Coke, all types—do	1,071	1,111	1,431	r 1,449	1,362
Fuel briquets—do	e 15	55	50	30	NA
Lignite (salable)—do	3,237	3,871	4,166	4,774	NA
Petroleum:					
Crude—thousand 42-gallon barrels	5,090	r 5,894	r 9,818	r 13,062	17,459
Refinery products:					
Gasoline—do	4,600	5,388	5,933	4,412	6,774
Kerosine and jet fuel—do	3,066	3,809	3,791	3,794	3,040
Distillate fuel oil—do	6,563	8,515	8,270	9,469	9,393
Residual fuel oil—do	9,400	11,277	11,461	12,850	15,804
Liquefied petroleum gas—do	130	279	549	e 577	126
Other (includes asphalt, solvent and miscellaneous)—do	677	1,023	1,285	e 1,406	899
Total—do	24,436	30,291	31,289	32,508	36,036

e Estimate. r Revised. NA Not available.

[1] In addition to commodities listed, Turkey produced about 3 million metric tons of limestone and 380,000 metric tons of dolomite in 1966.

[2] Grade of concentrate is about 45 percent antimony, and regulus 49 percent antimony, as reported in 1965.

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other comodities rose substantially during 1966. Thus, comparison of 1965 and 1966 output on the basis of tonnage does not show such a marked increase; for instance, copper production in 1966 was about the same as in 1965. Tonnage of coal, lignite, petroleum, cement, magnesite, and boron ores increased, while declines occurred in chromite, pyrite, and lead.

Although no gross values for mineral production were available for 1967, noteworthy quantitative increases were reported in production of chromite, manganese, mercury, lead-zinc ore, boron minerals and cement; whereas pyrite, antimony ore, and bauxite decreased.

TRADE

The value of total mineral commodity exports reached $54.6 million, a new record, principally because of high demand and exceptionally high world market prices for copper. The 1966 exports were up 17.6 percent from $43.6 million export value registered for mineral commodities in 1965. The chief contributors to 1966 exports were copper, chromite, borate ores, ferrochromium, and magnesite, both crude and processed.

Table 2.—Turkey: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1964	1965	1966	Principal destinations, 1966
Metals:				
Antimony ore and concentrate	2,629	3,434	2,909	Czechoslovakia 2,195; West Germany 332.
Chromite (all grades)	344,134	424,226	508,722	United States 209,035; Czechoslovakia 60,939.
Copper:				
Ore (10 percent)	8,430	8,100	-------	
Blister	13,004	20,195	19,919	Belgium-Luxembourg 6,074; West Germany 5,000; Japan 3,216.
Ferrochromium	r 5,862	5,946	7,367	Hungary 4,800; United Kingdom 1,227.
Iron and steel	-------	500	371	All to West Germany.
Lead ore and concentrate	2,540	1,500	4,561	Belgium-Luxembourg 2,524; United Kingdom 2,037.
Manganese ore	18,140	14,943	6,711	France 3,544; Yugoslavia 2,317; United States 850.
Mercury ------ 76-pound flasks	3,230	2,318	3,111	Netherlands 1,654; United Kingdom 730; Pakista.. 'i9.
Pyrite, cupreous	95,650	123,158	91,180	Italy 86,560; West Germany 4,620.
Silver concentrate	-------	60	-------	
Zinc:				
Calcined ore	4,450	7,836	7,150	Bulgaria 5,000; Yugoslavia 1,500.
Concentrate	2,886	-------	-------	
Zinc-lead ores	12,126	16,500	11,100	NA.
Nonmetals:				
Abrasives (natural)	9,217	16,655	26,838	United States 16,612; Netherlands 5,990; France 3,000.
Borates	118,408	152,564	175,325	Italy 57,480; France 39,676; United States 19,059.
Cement	2,460	-------	-------	
Magnesite:				
Crude	19,785	15,669	41,643	Austria 46,005; Belgium-Luxembourg 7,699; East Germany 5,300.
Calcined		18,228	24,146	
Stone and gravel:				
Marble	5,344	6,353	8,037	Lebanon 1,979; Switzerland 1,903; Italy 1,852.
Other stone and gravel	170	306	-------	
Meerschaum	58	46	29	Austria 12; United States 7.
Salt	128,938	88,519	51,859	All to Japan.
Other nonmetals	301	70	131	Various.
Mineral fuels:				
Coal (bituminous)	16,464	9,195	9,947	All to Greece.
Coke	-------	929	-------	
Lignite	38	-------	-------	
Petroleum refinery products:				
Gasoline	47,004	17,897	28,751	All to United Kingdom.
Distillate fuel oil	15,122	-------	-------	
Residual fuel oil	690,285	497,869	387,894	United Kingdom 204,843; Greece 82,346; Netherlands 38,789.

r Revised. NA Not available.

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The total value of mineral commodity imports in 1966 was over $19 million more than in 1965. Decreases in liquid fuels were more than offset by increases in value of such imports as manufactured fertilizers (up $10 million), steel (up $4 million), and nonferrous metals (up $3.8 million).

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	43.6	458.9	9.5
1966	54.6	490.5	11.1
Imports:			
1965	154.2	572.0	27.0
1966	173.7	718.3	24.2
Trade balance:			
1965	−110.6	−113.1	XX
1966	−119.1	−227.8	XX

XX Not applicable.

Table 3.—Turkey: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1964	1965	1966	Principal sources, 1966
Metals:				
Aluminum:				
Ingots	1,579	5,640	8,232	United States 1,814; France 1,696; Canada 1,601.
Semimanufactures	r 1,643	r 1,756	2,874	Japan 730; Hungary 388; France 262.
Copper and alloys, all forms	r 369	r 199	515	West Germany 109; Italy 97.
Iron and steel:				
Scrap	25,791	r 29,036	31,981	United States 31,955.
Pig iron, including cast iron	r 27,474	r 25,643	21,797	East Germany 11,829; Bulgaria 7,266; U.S.S.R. 2,348.
Ferromanganese and other ferroalloys.	r 6,358	8,495	10,542	Norway 7,670; Belgium-Luxembourg 840.
Ingots and other primary forms.	96,196	116,230	193,181	U.S.S.R. 67,905; West Germany 48,921; Hungary 38,840.
Semimanufactures	208,669	206,580	207,248	West Germany 45,694; France 26,870; United States 25,704.
Lead and alloys, all forms	r 1,460	94	2,575	Tunisia 890; West Germany 743; United Kingdom 634.
Nickel and alloys, all forms	r 97	r 77	88	Italy 37; West Germany 22.
Tin and alloys, all forms. long tons	r 866	923	1,079	United States 612; United Kingdom 384.
Zinc and alloys, all forms	5,046	r 6,931	5,902	Belgium-Luxembourg 2,604; Poland 872; United Kingdom 803.
Metallic ores, slags, and ashes	r 754	r 437	569	United Kingdom 374.
Other nonferrous metals and semimanufactures.	9	28	10	West Germany 4; United Kingdom 3
Nonmetals:				
Asbestos	2,455	2,654	6,673	U.S.S.R. 2,058; United Kingdom 1,837; Republic of South Africa 1,589.
Barite	2,455	200	742	Italy 400; United States 342.
Cement	r 91,534	r 47,649	163,367	U.S.S.R. 147,687; Rumania 14,100; Italy 862.
Clays, all types	r 2,493	r 2,650	1,414	Greece 607; Italy 209; United States 159; West Germany 133.
Fledspar and fluorspar	r 1,940	2,651	306	United Kingdom 245.
Graphite	139	140	146	West Germany 61.
Infursorial earths	65	76	57	NA.
Mica	53	33	-------	
Phosphate rock	92,517	100,529	148,089	Israel 145,555; Algeria 2,534.
Quartz and quartzite	r 48	r 86	74	All from Netherlands.
Sulfur	210	100	105	Untied States 56; France 25; West Germany 22.
Talc	(1)	220	-------	
Mineral fuels:				
Coal	300	(1)	333	West Germany 325.
Coal tars	4,083	1,045	-------	
Coke	4,083	4,200	7,933	France 6,433; U.S.S.R. 1,000; Italy 500.
Petroleum:				
Crude thousand tons	3,430	3,051	2,807	Iraq 1,141; Saudi Arabia 954; Bahrain 443.
Refinery products:				
Gasoline	2,571	4,673	1,506	United States 1,340.
Kerosine	r 26,943	r 33,764	22,690	Rumania 10,564; United States 9,939; Italy 1,002.
Lubricants	60,804	52,515	85,254	United States 77,815; Rumania 4,775.
Other	r 2,062	r 3,131	73,339	Rumania 34,431; U.S.S.R. 34,320.
Total refinery products.	92,380	94,083	182,789	

r Revised. NA Not available.
1 Revised to none.

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COMMODITY REVIEW

METALS

Aluminum.—Bauxite production continued on a trial basis; no large-scale mining was reported. However, imports of aluminum ingots and semimanufactures, mostly from the United States, Canada and France, were valued at about $7 million.

On May 9, 1967 in Ankara, a contract was signed by members of a Soviet Union team and the Director General of Etibank for construction of a $110 million aluminum plant at Seydişehir, about 290 kilometers south of Ankara. The plant is to produce 60,000 tons of aluminum, 200,000 tons of alumina, and about 25,000 tons of semifinished products annually upon completion, which is scheduled within 40 months from the date of contract signing. By yearend 1967, ground had been broken for the plant. Recently discovered bauxite deposits occur nearby; reserves are provisionally estimated at 10 to 15 million tons of bauxite.

Antimony.—Declining antimony output in 1966 and 1967 may be the result of decreased reserves at the Ozdemir Antimuan Madenleri A/S Şerketi mines in Turhal which were the leading antimony producers.

The newly established Mutlu Battery plant produced 112 tons of regulus in 1966 and 55 tons in 1967.

Chromite and Ferrochromium.—Chrome ore, one of Turkey's traditional mineral exports, surged back to levels reached in the early 1950's with total value passing $10 million for the first time since cessation of U.S. stockpile procurement. Difficulties in obtaining chromite from Southern Rhodesia due to United Nations sanctions apparently firmed Turkish chromite prices in 1966 as well as in 1967, with a quoted price of $26 to $27 f.o.b. Turkish ports for standard grades.

Etibank remained the main producer with a reported output of 221,589 metric tons in 1966.

Production of Etibank's Analya ferrochrominum plant totaled about 8,000 tons : 1966, using 16,560 tons of concentrate and about 6,000 tons of lump ore. In 1966 the company exported about 7,367 tons of low-carbon ferrochrome, 23 percent over that of 1965.

Copper.—In 1966 and 1967 blister copper production remained essentially at the 1965 level of about 26,000 metric tons. Exports of 19,919 tons in 1966 were down slightly from those of 1965, but under prevailing price conditions, a record value of about $25 million was earned. Exports of copper accounted for about 45 percent of total value of mineral commodity exports in 1966. Except for the blister copper recovered from 1,184 tons of ores purchased from private producers, all blister copper was recovered from two Etibank operations. At Murgul, the mined ore totaled 532,331 tons, with an average grade of 1.71 percent copper, from which 42,105 tons of concentrate was produced and 9,100 tons of blister copper was recovered. At Ergani, 388,270 tons of ore was mined with an average grade of 4.32 percent copper, including 152,554 tons of direct smelting ore; from the remaining ore, 33,979 tons of concentrate was produced. From the direct smelting ore and concentrates, 17,517 tons of blister copper was recovered. Also, 750 tons of cement copper was recovered from dump leaching.

Since 1965, Etibank has been examining the process and economic considerations of a major project commonly referred to as "the Black Sea Coast copper project." This project, as proposed, will be undertaken by a new company with 49 percent participation by Etibank and the remainder subscribed from private sector Turkish enterprise. There are two major districts within the project, the Murgul district and the Küre district. The Murgul district includes the Damar area with reserves of 11.4 million tons averaging 1.75 percent copper with a cutoff of 0.5 percent, and the Cakmakkaya area with reserves of 21 million tons averaging 1.08 percent copper. Within the Küre district reserves of 2.5 million tons with a 3.4 percent copper content have been found.

The new company will acquire the existing assets of Etibank partly by outright purchase and partly by payment of a royality on production. Production from newly developed and existing mines at Murgul and Küre will be sent by pipeline to Hopa and Inebulu, both on the Black Sea Coast. After preparation in planned new concentrating facilities, the concentrates will be shipped by sea to the port of Samsun. A new copper smelter will be constructed at Samsun which will produce about 40,000 tons of anode copper and 150,000 tons of sulfuric acid annually.

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Iron and Steel.—Iron ore output in 1967 did not reach the record high of 1966. All shipments went to the country's two integrated steel plants, the Eregli and Karabük steelworks. The Divrigi mines continued as the largest ore producer in 1967 with 793,988 tons mined and 740,634 tons shipped. The leading shipper to the Eregli steel plant was the Demir Export Company with 236,955 tons from the Çetinkaya mine and about 161,350 tons from the Otlukilise mine.

Table 4.—Turkey: Shipments of salable ore from selected iron ore mines

(Thousand metric tons)

Mine	Operator	1964	1965	1966
Divriği	Turk Demir ve Çelik	655	872	740
Kesikköprü	Kesikköprü Mining	95	e 60	e 65
Otlukilise	Demir Export (Koç)	77	116	161
Çetinkaya	do.	58	141	237
Karakuz	Bilgin Maden	40	59	68
Deveci	do.	38	50	91
Akdag	Necati Akin	---	31	30
Büyük Egmir	Dümeks	---	37	45
Karamadazi	Özkoyuncu Mining	4	37	45
Çalti	Kepman	---	15	10
Miscellaneous		11	39	e 41
Total shipments		978	1,457	1,533

e Estimate.

MTA initiated a new iron ore exploration program under the impetus of plans for a third integrated iron and steel plant. Investigations will be concentrated around the Kozan-Feke area, 100 kilometers north of Adana; the Şamli deposits southwest of Balikesir; and the Aramur deposits on the Mediterranean coast. All these deposits require more detailed sampling and testing to determine commercial possibilities. A $2.7 million joint iron ore exploration program by the MTA and the U.S. Geological Survey, under discussion with AID in 1966, was agreed upon in 1967.

Production of ingot steel at the State-owned Karabük steelworks and the Eregli iron and steel plant increased 71 percent to 844,098 tons, and output of finished rolled products totaled 458,496 tons, 71 percent over the 1965 level. Most of the increase resulted from operation of the Eregli plant at 80 percent of planned capacity during the year.

Reportedly, annual capacity of the Eregli iron and steel works is to be expanded from 470,000 tons to 900,000 tons in the near future. Apparently AID and some European sources will finance the expansion program.

The joint public-private Kirikkale plant, the privately owned Metaş plant near Izmir, and the joint public-private Electrometalurj plant near Izmir provided the remaining 1966 steel ingot output as follows: Kirikkale 30,000 tons; Metaş 40,750 tons; and Electrometalurj 10,000 tons. These plants primarily use scrap as raw material.

In 1966, discussion was initiated between U.S.S.R. iron and steel experts and the Turkish Government regarding construction of a 1-million-metric-ton-per-year steel mill in Turkey. At yearend 1967, the discussion continued and apparently both governments were in agreement that this integrated plant should be installed in Izmir, on the Aegean seacoast. Reportedly the initial capacity of 1 million tons of ingot steel would be expanded to 2.5 million tons by 1977.

Lead and Zinc.—Available information on 1967 lead-zinc ore production indicated an increase of about 10 percent over that of 1966.

In the latter part of 1967 a new company, Kayseri Çinko-Kuruşun Metal Sanayii A.S., reportedly was formed to refine zinc and produce lead ore from deposits in the Kayseri area. If approved by the Government, the company will have 35 percent Etibank participation and the remaining shares will be held by private investors. It is reported that the company's immediate plan is to undertake a large-scale drilling program and detailed geological investigation of the Zamanti valley deposits to prove the reserves.

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Manganese.—Manganese ore production in 1966 increased 57 percent over 1965 but declined somewhat in 1967. Exports of manganese ore, mostly containing over 46 percent manganese, dropped in 1966 to 6,711 tons, the lowest in the last 3 years. Apparently, the Eregli and Karabük steelworks use most of the domestic production thus curtailing overseas shipments.

Mercury.—With the improvements in mining techniques and new installations, the outlook for mercury industry in Turkey was bright. Production and exports reached new highs of 3,420 and 3,111 flasks, respectively in 1966, and 1967 output surpassed that of 1966. Etibank's Halikoy operation treated 30,648 tons of run-of-mine ore averaging 0.4 percent mercury to recover 1,935 flasks in 1966. The 1966 installation of a rotating kiln of 175-ton-per-day capacity at Sizma to treat ores averaging 0.5 percent mercury was reflected in the 1967 production increase of 19 percent.

NONMETALS

Barite.—The private mine operator, Hamdi Bozbag, was Turkey's sole barite producer and exporter in 1966 and 1967. Output of barite has surged from 981 tons in 1963 to 31,590 tons in 1967. The first official record of barite export appeared in 1966 in an amount of 1,181 tons, mostly to Africa and Middle East countries. Imports have declined from 2,450 tons in 1964 to 742 tons in 1966.

It appears that Turkey soon will not only be able to satisfy domestic needs, but will increase barite exports to most oil producing countries. Bozbag's newly acquired barite properties near Maras have not been explored thoroughly; however, an indicated reserve of 150,000 tons of high-quality ore, suitable for grinding to drilling mud specifications, has been delineated.

Boron.—Mine production of boron set a new record in 1967 (287,607 tons) more than doubling 1964 output, and exports of boron minerals through 1966 continued to increase. Etibank (public sector) remained the main producer, followed by Türk Boraks Madençilik (Turk Borax), a subsidiary of Boron Consolidated Ltd., and Rasih ve Ihsan and Hasmettin Yakal, all private sector producers.

Construction of the borax and boric acid plant of Etibank at Bandirma was completed in early 1967. The plant at full operation is expected to produce 20,000 tons of borax and 6,000 tons of boric acid annually.

Even though a systematic investigation to establish known reserves of boron minerals has not been made in Turkey, the known and probable reserves were conservatively estimated at about 40 million tons and it seems likely that additional deposits may be found.

In 1966, exports were about 175,325 tons valued at $4.9 million, representing increases of 14.9 percent in tonnage and 17.8 percent in value over 1965. Borates now rank third in value among Turkish mineral exports. Production and export have virtually tripled since 1961. A factor in the rapidly growing demand for Turkish colemanite apparently is the ability to utilize the clean crushed ore as a direct additive to fiber glass melts.

Cement.—The 10-percent increase in cement output in 1967 fell short of the 16 percent growth recorded for 1966, but was still quite sizable. These increases were the result of expansion of five plants. New units of 200,000-ton-per-day capacity were brought into operation at the State-owned Adana and Elazig plants. (The latter plant was expanded to meet the requirements of the Keban dam.) Conversion of the State-owned plants at Gaziantep, Söke, and Afyon to the dry process also increased the annual capacity of each by 50,000 to 60,000 tons and brought the total increase in annual production capacity to nearly 600,000 tons.

Production and sales by the Turkiye Cimento Sanayii T.A.S. (Turkish Cement Industries), amounting to 2,114,000 tons, represented 54.7 percent of the total 1966 output. Total cement imports in 1966, mainly from the U.S.S.R., amounted to about 163,000 tons, over three times those of 1965.

In order to meet the continued high domestic demand, new State-owned plants of 300,000- and 220,000-ton annual capacity, respectively, were under construction at Trabzon and Van. Also the private sector was planning to finance new plants at Bursa, Izmir, and Ankara.

Fertilizer Materials.—Combined chemical fertilizer production for 1967 declined 5 percent, and presumably, negotiations

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in progress at yearend 1966 continued for foreign participation in new chemical facilities, particularly for phosphatic and nitrogenous fertilizers, needed to meet a consumption target of 1 million tons annually.

Plans to utilize low-grade domestic phosphorite deposits near Mardin in southwest Turkey as raw material were abandoned for the time being. Phosphate rock imports, chiefly from Israel in 1966, presumably were continued to provide raw material for superphosphate production.

According to press announcements, the Turkish Nitrogen Industry and the Kuwait Chemical and Fertilizer Company signed an agreement in 1967 to construct a fertilizer plant in Mersin, Turkey. The construction is expected within 30 months, at a cost of about $50 million, including $25 million in foreign exchange cost to be advanced by Kuwait Chemical and Fertilizer Company. Accordingly, a joint stock company will be formed, 40 percent to Kuwait, 40 percent to the Turkish Nitrogen industry, and 20 percent to a group of Turkish private businessmen, including the Iş Bankasi. When completed, the complex is planned to produce 500,000 tons of ammonium nitrate and 200,000 tons of diammonium phosphate annually.

Table 5.—Turkey: Production of chemical fertilizer

(Thousand metric tons)

Commodity	1963	1964	1965	1966
Ammonium nitrate	59	86	64	65
Ammonium sulfate	89	63	92	86
Superphosphate	175	152	221	222
Total [1]	322	301	r 377	r 374

r Revised.
[1] Data may not add to totals shown because of independent rounding.

Magnesite.—Value of magnesite, crude and calcined, marketed abroad increased from about $911,000 in 1965 to approximately $1.9 million in 1966, as two new sintering plants for caustic magnesite entered production. Total run-of-mine output was about 128,000 tons, from which 97,000 tons of marketable ore was obtained. Total exports in 1966 totaled 41,643 tons of crude ore and 24,146 tons of caustic magnesite, the latter with an average value of $52.50 per ton. Data for 1967 was not available.

Construction of the Sümerbank refactory brick plant at Meran, near Konya, by a Japanese firm continued in 1967; no details of trial production or assumption of full production were available. Reportedly the plant is to produce chrome-magnesite refactories for the Turkish metallurgical industry.

Pyrite.—The production of cupreous pyrite from Etibank's Küre operation decreased approximately 27 percent to about 125,000 tons in 1967. Exports during 1966, mostly to Italy and West Germany, totaled 91,180 tons of run-of-mine ore containing 47 percent sulfur and 2.5 percent copper.

In 1966 two adits at different elevations were being driven to intersect ore bodies containing 2.4 million tons of 3 to 4 percent copper that were encountered in 1965 in diamond drill holes on Bakir Baha mountain between the Asikkay open pit and the old workings near Küre village. In 1967 Etibank was organizing a new company in which it would have 49 percent participation; the remainder would be subscribed from the private sector of Turkish enterprises.

Stone.—Marble production in 1966 increased to a new record of 19,000 cubic meters, about 26 percent over that of 1965. Almost half of 1966 production was exported to Lebanon, Switzerland, and Italy. Most of the marble output came from the Marmara, Afyon, Sögüt-Bilecik, and Gebze regions, all in the northwestern section of the country.

Sulfur.—A new autoclave of Polish manufacture to treat high-grade sulfur ores at Keçibolu was put into operation

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in late 1966 resulting in production increase of about 2,734 tons in 1967. New reserves containing an estimated 1 million tons of ore averaging 40 to 50 percent sulfur were delineated in 1967 by diamond drilling and underground development work. The fact that Etibank has proposed the establishment of a new company to construct a sulfuric acid plant in Samsun in connection with the copper smelter suggests that there may be an increase in production of sulfuric acid and sulfur in Turkey in the near future.

MINERAL FUELS

More than half of Turkey's energy requirement is met by wood (fuelwood or charcoal) and animal waste. The remainder is supplied by indigenous coal, hydroelectric power, and petroleum, supplemented by some crude oil and refinery products imported from abroad.

Coal (Bituminous).—Of total 1966 coal production, Turkiye Kömür Işletmeleri Kürümu (TKI), the Turkish state coal mining industry, produced 4,880,000 tons while only 13,000 tons was produced by the private sector. Output by sector and mine during 1964–66 was as follows:

	Thousand metric tons		
	1964	1965	1966
Public sector:			
Çelik (Karadon)	1,701	1,670	1,848
Üzülmez	1,325	1,273	1,447
Kozlu	1,113	1,130	1,234
Kandilli (Armutçuk)	309	316	351
Private sector:			
Diyarbakir	-----	12	13
Total	4,448	4,401	4,893

Coke.—Coke production in 1966 reached a record high of 1,448,846 tons. Plants contributing to this total were as follows: Karabük steel plant, 809,745 tons; Eregli steel plant, 389,808 tons; municipal gas plants, about 177,573 tons; and Zonguldak semicoke plant, about 71,720 tons. Preliminary figures for 1967 indicated a somewhat lower level of coke production, about 6 percent below the 1966 output.

Lignite.—According to MTA, a new lignite discovery was made in the latter part of 1967 near Elbistan in the province of Maraş. Unofficial estimated reserves were given at 1 billion tons.

In 1966, with the exception of the Degirmisaz mine, all lignite mines owned by TKI increased production. Although detailed production of the private sector of the lignite industry was not available, total production showed an increase of about 13 percent in 1966, while total TKI production, from various regions, increased 15 percent in 1966 over that of 1965.

Production of salable lignite by some of the principal TKI mines and all privately operated mines was as follows:

Producer	Thousand metric tons		
	1964	1965	1966
Public sector:			
Tunçbilek	1,288	1,181	1,357
Soma	551	623	778
Degirmisaz	195	161	69
Seyitömer	506	544	652
Dodurga	-----	25	61
Saray	-----	-----	1
Beypazuri	-----	-----	3
Subtotal	2,540	2,534	2,921
Private sector	1,331	1,632	1,853
Total	3,871	4,166	4,774

Petroleum.—Available information in 1967 indicated that crude petroleum production reached a new peak, 33 percent greater than in 1966. Output has shown a steady increase in recent years, but no new discoveries were reported in 1966 or 1967. The production increase between 1964 and 1965 was shared by all producers but between 1965 and 1966, Ersan's production leveled off, as shown in the following tabulation:

Company	Output, thousand 42-gallon barrels		
	1964	1965	1966
Turkiye Petrolleri A.O. (TPAO)	4,044.8	4,486.4	4,902.4
Mobil Exploration Mediterranean Inc. (Mobil)	1,011.2	2,841.6	3,334.4
N.V. Turkse Shell (Shell)	646.4	2,227.2	4,563.2
Ersan Petrol Sanayii (Ersan)	192.0	262.4	262.4
Total	5,894.4	9,817.6	13,062.4

Lack of notable new discoveries is indicated by decreased exploration activity in recent years, although total footage drilled in wildcat holes showed a slight increase

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in 1965 and 1966, as shown in the following tabulation:

Year	Thousand feet drilled	
	Wildcat	Development
1964	140	131
1965	170	270
1966	179	238

Unconfirmed information indicated that in 1967 Shell was the leading producer with 6.7 million barrels, followed by TPAO with 6.3 million barrels, Mobil with about 4.04 million barrels, and Ersan with about 307,000 barrels.

Detailed geological mapping, geophysical studies, and drilling previously initiated by MTA in Erzurum province continued in 1967, but results were not reported.

The first offshore petroleum drilling operation in Turkey was commenced in 1966 off the Mediterranean coast about 15 kilometers from the port of Mersin. The operating companies were the Continental Oil group from the United States which has 43 percent interest in the 2,000-square-kilometer offshore area; Adana Basin Concessions, with Gewerkschaft Elwerath of West Germany, 43 percent; and Panoil, 14 percent. However, results were not available for publication.

In August 1967, a ground breaking ceremony for the new Izmir refinery took place. The refinery, scheduled for completion in 1970, will have an initial capacity of 70,000 barrels daily that eventually will be raised to 120,000 barrels per day. The refinery to be operated by TPAO was financed by a loan from the U.S.S.R. which will be reimbursed in agricultural products.

It is predicted that completion of expansions of the existing Izmit (TPAO-California Texas Oil Corp.) and Mersin (Mobil-Shell-British Petroleum) refineries, together with TPAO's refinery at Batman, will increase Turkey's refinery capacity in 1968 to 7.2 million tons of pertoleum per year, a quantity more than adequate for the country's consumption.

The 18-inch, 560-kilometer pipeline between Batman (southeast Turkey) and the Mediterranean seaport Iskenderun, was completed in 1967. The initial capacity of 70,000 barrels per day can be expanded to 100,000 barrels daily when storage facilities and additional pumps are installed.

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The Mineral Industry of the U.S.S.R.[1]

By V. V. Strishkov[2]

The U.S.S.R. maintained its position in 1967 as the world's second largest producer of industrial products. Compared with 1966, production of electric power increased by 44 billion kilowatt-hours, oil by 23 million tons, gas by 14 billion cubic meters, coal by 10 million tons, pig iron by 4.5 million tons, steel by 5.3 million tons, finished rolled metal by 4.5 million tons, mineral fertilizers by 4.2 million tons, and cement by 4.8 million tons. There were also increases in output of aluminum, copper, zinc, and nickel.

Practically all mineral commodity exports rose in 1967. Fuel exports were the largest and fastest growing commodity group in Soviet trade to the West. The rate of growth of oil exports may increase despite rising home demand and production and transport difficulties.

Growth that occurred in the Soviet mineral industry generally was not caused by gains in worker productivity, but by considerable increases in the labor force and by mining a greater volume of uneconomic deposits. At the Donetskugol' combine in the Donets basin, 250,000 workers produced about 55 million tons, or about 0.7 ton per man-day of run-of-mine coal.

There were over 1.3 million "production workers" and 72,000 university graduate engineers and 121,000 technicians in the Soviet ferrous industry in 1967. The coal industry employed 2,182,000, including 54,000 university graduate engineers and 125,000 graduate technicians. The oil, gas, and petrochemical industries employed 2.6 million employees. There were 297,000 workers engaged in oil and gas pipeline construction in 1967, and 500,000 employees in the geological prospecting organizations of the U.S.S.R., including 112,160 specialists with university and technical education.

The turnover of personnel in individual mineral industry operations reached 25 to 80 percent a year. This was caused mainly by the lag in building houses and in providing public and medical services, by low material incentives, and by heavy manual work and unsafe conditions.[3]

On March 14, 1967, the Presidium of the Supreme Council (Parliament) of the U.S.S.R. approved a decree providing a major change in the Soviet normal workweek. The gradual transition of most wage and salary earners from 6 to 5 workdays per week was accomplished in 1967. The total number of legally prescribed working hours per week (41 on the surface and 36 underground) remained unchanged. Because of manpower shortages, the Soviets planned to increase the working day to more than 8 hours where work is not labor intensive.

Goals of the 1967 plan were not fulfilled in several areas of the mineral industry. The production of electric power, coal, gas, and many other mineral commodities were below both industry requirement and 5-year-plan targets. New goals were planned for 1967 through 1970. More than one-third of the enterprises of the Ministry of Nonferrous Metallurgy and the Ministry of Construction Materials Industry failed to fulfill production cost reduction plans. Many coal-producing enterprises failed to fulfill production quotas and labor productivity targets. In 1966, 1,239 million

[1] The statistical data used in this publication, with a few indicated exceptions, are taken from the sources published by the U.S.S.R.

[2] Soviet Union specialist, Division of International Activities.

[3] Ekonomicheskaya gazeta (Economics Gazette). Moscow, 1966, No. 47, pp. 4–5.

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rubles were spent on geological exploration.

The U.S.S.R. continued to experience considerable difficulty in completing mineral projects on schedule because efforts were dispersed over a large number of projects. The fact that it sometimes takes 10 to 15 years to develop a mine (1- to 2-million-ton-per-year capacity) has contributed to disparities between mine, concentration plant, and metallurgical plant capacities. Investments frozen for long periods on unfinished construction totaled about 70 percent of the volume of capital investments. For example, in 1967, coal industry enterprises that were under construction were valued at an estimated 1.3 billion rubles.

While the U.S.S.R. does not publish statistical data on injuries in the mineral industry, available Soviet information reveals that fatal injuries in the mineral industry were great. In 1967, there were fatal injuries at more than half of Soviet coal mines, at 20 percent of metal mines and open pits, and at 10 percent of construction material enterprises.

The State plan for 1968 and the development plans for the national economy in 1969 and 1970 were approved by the Supreme Soviet on October 12, 1967. The main goals set forth were for a significant growth of heavy industry and steady development rates for mineral industry. In 1968, the volume of industrial production is to be increased by 8.1 percent compared with that of 1967. It is planned to increase nonferrous metal production by almost 9 percent, with aluminum output to rise by 10.5 percent, copper and zinc by 8.2 percent, titanium and manganese by more than 10 percent, and mercury by 20 percent. Sulfuric acid and phosphorus fertilizer output is to increase by 19 percent. The 1968 plan envisages increase over 1967 capital investments of 21.3 percent in ferrous industry, 12.4 percent in nonferrous industry, and 35 percent in chemical industry. The main share of capital investments during the 1968–70 period is directed towards the development of the aluminum, copper, nickel-cobalt, and platinum-group metals industries. It is planned to increase the average monthly earnings of Soviet workers and employees in 1968 to 108.6 rubles, or 6 percent over those of 1967.

The level of Soviet industrial production in 1967 and that planned for 1968 and 1970 follows in million metric tons unless otherwise specified:

Commodity	Production			Planned production	
	1955	1960	1967	1968	1970
Iron ore	71.9	107	168	172.5	211.5
Pig iron	33.3	46.8	74.8	79	94–97
Steel	45.3	65.3	102.2	107.3	124
Rolled metal	35.3	50.9	81.7	85	96
Steel pipes	3.5	5.8	10.6	• 11.5	14–17
Cement	22.5	45.5	84.8	• 90	100–105
Mineral fertilizers	9.7	13.9	40.1	42.2	62
Coal (bituminous, anthracite, and lignite)	391.3	513	595	603.6	635
Coke	43.6	56.2	• 69	71.9	80
Natural gas—billion cubic meters	10.4	47	159	173	215
Peat	50.8	53.6	• 60	• 70	92
Petroleum, crude	70.8	148	288.3	309	350
Power, electric—billion kilowatt hours	170.2	292.3	589	650	800

• Estimate.

PRODUCTION

Because Soviet mineral statistics were not published in many cases, many of the data in the production table are estimates, representing at best an order of magnitude. The increase in Soviet mineral production in 1967 was essentially due to additional capacity and labor rather than to productivity gains.

Reportedly, 70 elements were being produced in the U.S.S.R. in 1967. More than 80 percent of the petroleum, more than 50 percent of the coal, half of the steel, and two-thirds of the electric power were produced in the Russian Soviet Federated Socialist Republic (R.S.F.S.R.).

The Ukraine provided more than one-third of total Soviet coal and natural gas output, 55 percent of iron ore, 50 per-

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cent of pig iron, more than 40 percent of steel and rolled metal, and nearly 50 percent of metallurgical equipment.

Kazakhstan occupied third place in Soviet mineral production and was the nation's leading producer of lead, copper, zinc, chromite, and rare metals, although metallurgical enterprises in the Altay region experienced raw material shortages in 1967 because of lags in mine expansion and benefication technology.

The Asian part of the U.S.S.R. produced the following percentages of the 1966 national totals: Electric power 24.6, petroleum 8.0, natural gas 17.7, steel 8.5, coal 40.5, iron ore 16.1, mineral fertilizers 15.9, and cement 23.6. It is planned that by yearend 1970, the regions east of the Urals will produce about 45 percent of the total coal output in the U.S.S.R., 35 percent of natural gas, 16 percent of crude oil, 28 percent of power, 69 percent of alumina, 37 percent of aluminum, and 58 percent of copper.

Table 1.—U.S.S.R.: Estimated [1] production of mineral commodities

(Thousand metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Aluminum:					
Ores and concentrates:					
Bauxite, 26 to 52 percent alumina	4,300	4,300	4,700	4,800	5,000
Nepheline concentrates, 25 to 30 percent alumina	400	500	900	950	1,000
Alunite ores, 16 to 18 percent alumina	30	40	50	r 500	1,000
Metal, smelter:					
Primary	760	800	840	890	965
Secondary	75	80	85	90	100
Antimony, content of ore—metric tons	6,100	6,100	6,200	r 6,300	6,400
Arsenic, white (As_2O_3)—do	6,500	6,500	6,800	r 6,900	7,000
Beryl, cobbed, only 10 to 12 percent BeO metric tons	1,000	1,000	1,000	1,100	1,200
Bismuth—do	30	30	35	35	40
Cadmium—do	1,700	1,800	1,900	r 2,050	2,200
Chromite ore, 30 to 56 percent Cr_2O_3—do	r 1,080	r 1,180	r 1,270	r 1,450	1,570
Cobalt—metric tons	1,200	1,200	1,300	1,300	1,400
Copper:					
Ores, gross weight, 0.5 to 2 percent Cu	59,000	r 65,000	r 70,000	r 75,000	80,000
Smelter:					
Primary	600	650	700	750	800
Secondary	135	140	145	150	160
Gold—thousand troy ounces	4,370	4,650	5,030	5,370	5,700
Iron and steel:					
Iron ore, 55 to 63 percent Fe [2]	r 137,475	r 145,584	153,432	r 160,271	168,000
Iron ore sinter [3]	93,531	103,613	NA	115,662	123,185
Pellets	-------	---------	---------	1,607	2,870
Pig iron and ferroalloys: [3]					
Pig iron for steelmaking	48,366	51,594	NA	59,832	64,147
Foundry pig iron	8,617	8,977	NA	8,979	9,308
Spiegeleisen	91	81	NA	93	91
Ferromanganese	821	916	NA	902	911
Other blast furnace ferroalloys	796	809	NA	458	855
Total	r 58,691	r 62,377	66,184	70,264	74,812
Steel: [3]					
Ingots	74,411	78,921	NA	90,492	95,653
Steel for casting	r 5,815	6,113	NA	6,415	6,582
Total	r 80,226	85,034	91,021	r 96,907	102,235

See footnotes at end of table.

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Table 1.—U.S.S.R.: Estimated [1] production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals—Continued					
Iron and steel—Continued					
Steel—Continued					
Semimanufactures:					
Heavy sections	15,549	16,747	NA	25,744	28,230
Light sections	5,464	5,730	NA		
Wire rods	4,369	4,635	NA	5,819	6,454
Pipe stock	3,458	3,777	NA	4,099	4,195
Tubes from ingots	1,083	1,121	NA	1,157	1,239
Plates and sheets:					
More than 5 millimeters thick	8,850	9,464	NA	8,374	8,729
Other	7,460	7,944	NA	r 11,225	11,636
Total plates and sheets	16,310	17,408	NA	r 19,599	20,365
Strip	4,128	4,507	NA	5,984	6,468
Railway track material	3,278	3,228	NA	3,274	3,276
Wheels, tires and axles	825	808	NA	787	831
Unspecified, for sale	535	407	NA	740	673
Other	122	123	NA	92	65
Total semimanufactures	55,121	58,491	61,600	67,295	71,796
Selected end products: [4]					
Welded pipes and tubes	3,770	4,022	NA	5,496	5,978
Seamless pipes and tubes	3,751	4,102	NA	4,409	4,600
Total	7,521	8,124	r 9,000	9,905	10,578
Cold-rolled sheets	2,155	3,031	NA	3,862	4,081
Tinplate	368	406	NA	466	483
Galvanized sheets	267	303	NA	332	384
Electrical sheets	742	790	NA	862	893
Wire, plain	1,759	1,936	NA	2,422	2,649
Lead, smelter:					
Primary	315	330	350	375	400
Secondary	65	70	70	75	80
Magnesium	r 33	r 34	r 35	r 37	40
Manganese ore [2]	6,663	7,096	7,576	• r 7,000	7,200
Mercury, 76-pound flasks	35,000	35,000	40,000	40,000	45,000
Molybdenum, metric tons	5,700	6,000	6,200	6,500	7,000
Nickel, smelter [3]	r 75	r 80	r 85	r 90	100
Platinum, thousand troy ounces	r 1,300	r 1,500	1,700	r 1,800	1,900
Silver, do	r 28,000	r 29,000	r 31,000	r 33,000	35,000
Tin, smelter:					
Primary, long tons	21,000	22,000	23,000	24,000	25,000
Secondary, do	6,000	7,000	7,000	8,000	8,000
Titanium	5	r 6	r 7	r 8	10
Tungsten concentrates, 60 percent WO_3 basis, metric tons	r 10,000	11,000	r 12,000	r 12,500	13,000
Zinc:					
Recoverable metal content of domestic ores	r 400	r 430	r 470	r 500	535
Smelter:					
Primary	415	445	480	510	540
Secondary	45	50	55	55	60
Nonmetals:					
Asbestos	685	r 735	745	755	769
Barite	200	r 220	r 230	r 250	260
Boron minerals and compounds, B_2O_3 content	63	r 64	r 65	r 67	68
Cement [2]	61,018	64,934	72,388	79,992	84,800
China clay (kaolin)	1,500	1,500	r 1,600	r 1,600	1,700
Diamond, thousand carats	3,000	r 4,000	r 5,000	r 6,000	7,000
Diatomite	310	r 320	r 330	r 350	360
Feldspar	r 210	r 220	r 230	r 240	240
Fertilizer materials:					
Crude:					
Nitrogen compounds, N content equivalent	2,000	2,100	2,500	3,000	3,500
Phosphate:					
Apatite ore, 17.7 percent P_2O_5	r 11,400	r 16,000	18,800	r 20,200	21,200
Sedimentary rock (ore), 13 percent P_2O_5	r 7,600	r 8,700	r 2 12,100	r 13,500	15,000
Total	r 19,000	r 24,700	r 30,900	r 33,700	36,200
Potash, K_2O equivalent	2,050	2 2,200	2,350	2,550	2,750

See footnotes at end of table.

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Table 1.—U.S.S.R.: Estimated [1] production of mineral commodities—Continued

(Thousand metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Nonmetals—Continued					
Manufactured: [2]					
Nitrogenous, bulk	8,575	10,222	13,217	e 15,700	e 17,400
Phosphatic, bulk	7,857	10,677	12,240	e 13,400	e 14,900
Potassic, bulk	3,365	4,553	5,691	e 6,600	e 7,600
Others	r 138	110	105	e r 160	e 200
Total	19,935	25,562	31,253	e 35,860	e 40,100
Fluorspar	270	300	350	350	380
Graphite	55	r 60	r 60	r 65	65
Gypsum [2]	4,239	4,203	4,344	e 4,400	e 4,500
Lime, dead burned [2]	16,013	16,198	17,686	e 18,000	e 18,000
Magnesite	2,700	2,800	2,900	2,900	3,000
Mica	r 31	r 32	r 33	r 34	35
Pyrite, gross weight	3,200	3,200	3,300	3,300	3,500
Refractories: [2]					
Shamotte	5,543	5,695	5,790	e 5,900	e 6,000
Dinas (quartizite-lime)	616	629	637	e 650	e 650
Magnesite and chrome magnesite	1,250	1,313	1,372	r e 1,450	e 1,500
Magnesite powder	1,218	1,220	1,265	e 1,300	e 1,300
Total	8,627	8,857	9,064	e 9,300	e 9,450
Salt [2]	9,560	10,100	9,500	e 9,500	e 9,500
Sulfur (excluding sulfur content of pyrite)	1,350	1,350	1,430	1,430	1,500
Talc	350	350	360	360	370
Mineral fuels:					
Coal: [6]					
Brown [2]	136,590	145,127	149,850	146,436	151,000
Hard:					
Coking [2]	127,063	133,617	138,959	e 143,000	e 148,000
Anthracite [2]	76,683	78,840	80,467	e 82,000	e 83,000
Undifferentiated	191,383	196,413	208,455	214,164	e 209,000
Total hard coal	395,129	408,870	427,881	439,164	440,000
Total [2]	531,719	553,997	577,731	585,600	595,000
Coke, oven and beehive [2]	63,873	66,282	67,462	e 68,000	e 69,000
Crude oil [2]	206,070	223,600	242,900	r 265,100	288,300
Fuel briquets	8,500	8,700	8,700	8,800	8,900
Oil shale [2]	18,308	20,233	21,259	e 21,400	e 21,500
Peat, agricultural use	100,000	110,000	130,000	130,000	130,000
Peat, fuel use [2]	58,500	59,500	46,000	e 65,400	e 65,000
Natural gas [2]—billion cubic feet	r 3,231	r 3,892	r 4,570	r 5,110	5,601
Electric power [2]—billion kilowatt hours	412	459	507	545	589

e Estimate. r Revised. NA Not available.

[1] Estimated except where noted.

[2] Reported in Soviet sources except for estimates in 1966 and 1967 columns, where indicated.

[3] Data for 1963–64, United Nations Quarterly Bulletin of Steel Statistics for Europe, V, XVI, No. 1, 1965, p. A–23; for 1966, V. XVIII, No. 3, 1967, p. A–23; for 1967, V. XIX, No. 1, 1968, p. A–23.

[4] Items listed under this heading are produced from semimanufactures listed above and possibly also from imported material. Therefore, these data are not additive to the total of semimanufactures listed.

[5] Includes production from scrap.

[6] The average ash content of the coal shipped from the mines was 19.6 percent and average calorific value was a little more than 5,000 kilocalories per kilogram in 1967.

TRADE

Tables 2 and 3 are derived from official statistics of the Ministry of Foreign Trade for 1966 and partially for 1967. Official detailed figures by country for 1967 are not yet available, but much the same general pattern can be expected.

The value of total Soviet trade expanded from 14.6 billion rubles in 1965 to 15.1 billion in 1966 and 16.4 billion in 1967. Exports increased about 9 percent and imports were almost 8 percent higher in 1967 than in 1966. The 1968 plan (17.5 billion rubles) envisages a 6.7-percent increase in Soviet foreign trade turnover. By 1970, the value of the U.S.S.R.'s foreign trade is to reach 20 billion rubles.

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The relative importance of the major mineral commodity groups within the official balance of Soviet total trade is as follows:

Commodity group	Percent of total value					
	1965		1966		1967	
	Exports	Imports	Exports	Imports	Exports	Imports
Aluminum	1.3	------	1.3	------	1.3	------
Copper	.7	------	1.2	------	.7	------
Ferroalloys	.7	------	.6	------	.5	------
Iron ore	3.1	------	2.7	------	2.7	------
Manganese ore	.3	------	.3	------	.2	------
Pig iron	2.2	.1	2.1	.1	1.9	.1
Pipes	.7	1.9	.7	1.6	.6	1.6
Rolled steel	7.7	1.6	6.8	1.2	6.4	1.1
Rolled nonferrous metals	.6	.2	.6	.2	.6	.2
Asbestos	.4	------	.4	------	.4	------
Cement	.2	------	.3	------	.3	------
Mineral fertilizers	.8	------	.9	------	1.0	------
Coal and anthracite	3.6	1.3	3.1	1.4	2.8	1.2
Coke	1.0	.2	.9	.2	.8	.2
Crude oil	7.5	------	7.4	------	7.4	------
Petroleum products	4.7	.9	4.6	.7	4.6	.6

Sources: Vneshnyaya torgovlya SSSR za 1966 god (Foreign Trade of the U.S.S.R. for 1966). Moscow, 1967, 334 pp. Vneshnyaya torgovlya (Foreign Trade). Moscow, No. 6, June 1968, p. 58.

Mineral industry products reportedly accounted for 38.8 percent of the value of all officially recorded exports in 1966 compared with 37.0 percent in 1967, a decrease of 1.8 percent. The Soviet Union remained a significant exporter of mineral fuels, manganese, iron, and chromite ores, steel ingots, aluminum, precious metals, and apatite concentrates.

Mineral commodity imports totaled 13.2 percent of officially recorded imports in 1966 compared with 13.3 percent in 1967.

Official foreign trade statistical reviews do not include exports of precious metals. The annual total value of known exports of these metals, as measured by recorded imports of other countries, has been consistently high, notwithstanding an appreciable annual fluctuation.

Precious metals is one of the largest commodity groups by value. The value of 1966 Soviet platinum-group metal exports as reflected in western sources, were ($72,954,000) and silver exports from the same sources were ($14,686,000). The U.S.S.R. exported 868,502 troy ounces of gold[4] to the United Kingdom alone in 1966. The U.S.S.R. supplies 20 to 25 percent of world exports of platinum, 70 to 75 percent of palladium, and 60 to 70 percent of rhodium. Precious metals are purchased from the Soviet Union by more than 40 firms in the United Kingdom, the United States, France, West Germany, Japan, and other countries. Since 1960, when the U.S.S.R. began to sell Soviet-produced diamond, exports have assumed large proportions. There is steady increase in the sales of cut diamonds.

Soviet trade in selected mineral commodities by country groups in 1966 is shown in table 4.

The Soviet Union was a net importer of nonferrous semimanufactures, steel pipe, bauxite, tin, barite, fluorspar, talc, mica, and some other mineral commodities. Soviet purchases of machinery and equipment accounted for approximately half of all Soviet imports from the United Kingdom, including complete equipment for a chemical industry complex. The U.S.S.R. imported large quantities of pipe from Japan, West Germany, Sweden, and Italy. A considerable part of the imports from developing countries were goods delivered in payment for loans from the U.S.S.R.

Recent contracts between the U.S.S.R. and Middle Eastern countries projected cooperation of the Soviet Union in the development of petroleum resources in Syria and Iraq. It is likely that the U.S.S.R. would be willing to buy Middle East oil in exchange for construction of petroleum refineries.

[4] Samuel Montagu and Co. Ltd. Annual Bullion Review 1966. London, February 1967, p. 11.

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Table 2.—U.S.S.R.: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Ingots and equivalent primary forms.	229,000	255,700	East Germany 90,000; United Kingdom 34,900.
Semimanufactures, including those of duraluminu.	42,100	54,800	East Germany 10,300; Czechoslovakia 8,332.
Antimony, primary forms	2,700	2,400	Bulgaria 506; Japan 300; Netherlands 200.
Cadmium, primary forms	900	600	Czechoslovakia 205; East Germany 203; Netherlands 100.
Chromite, (48 to 56 percent Cr_2O_3).	748,000	920,000	United States 289,000; Japan 145,000; West Germany 100,000; France 99,000.
Cobalt, primary forms	200	100	NA.
Copper:			
Ingots equivalent primary forms:			
Unalloyed	93,100	120,100	East Germany 42,900; Czechoslovakia 27,400; Hungary 7,900.
Alloyed (bronze)	3,300	2,800	East Germany 1,900.
Semimanufactures:			
Unalloyed	5,500	5,300	Cuba 2,900; Rumania 840; Czechoslovakia 601.
Alloyed (copper-zinc)	5,200	2,600	Bulgaria 876; Cuba 800.
Ilmenite	8,200	7,100	All to Italy.
Iron and steel:			
Iron ore—thousand tons	24,138	26,118	Poland 7,850; Czechoslovakia 7,662; East Germany 2,594.
Pig iron—do	3,659	4,384	Japan 1,193; Poland 737; East Germany 670.
Ferrous scrap—do	565	615	East Germany 154; Japan 118; Finland 111.
Ferroalloys:			
Ferrotungsten	1,900	400	Rumania 56,900; Czechoslovakia 45,000; Netherlands 29,700; United Kingdom 28,200.
Ferrosilicon	84,000	91,400	
Ferromanganese	67,300	87,400	
Ferrochromium	24,800	29,800	
Ferromolybdenum	4,700	1,100	
Not specified	22,600	64,500	
Total	205,300	274,600	
Semimanufactures:			
Rolled thousand tons products, excluding pipes.	4,547	5,019	East Germany 1,937; Rumania 829; Bulgaria 396.
Steel thousand tons pipes.	266	290	East Germany 147; Bulgaria 41.
Lead, ingots and equivalent primary forms.	102,500	87,900	East Germany 41,300; Czechoslovakia 19,700; Hungary 9,800.
Magnesium, primary forms	3,500	8,100	East Germany 1,493; Canada 1,000.
Manganese ore:			
Metallurgical grade	1,020,000	1,218,000	Poland 317,000; East Germany 198,000; Czechoslovakia 149,000; United Kingdom 134,000.
Battery and chemical	15,800	16,900	Netherlands 9,000; East Germany 2,500; Poland 2,100.
Mercury—76-pound flasks	697	581	NA.
Nickel	12,799	18,200	United Kingdom 12,700; Czechoslovakia 2,400; East Germany 2,100.
Tin, primary forms—long tons	7	7	NA.
Tungsten, concentrate	3,320	1,680	United Kingdom 900; West Germany 600.
Zinc: Ingots and equivalent primary forms.	132,700	86,300	East Germany 36,800; Czechoslovakia 13,900; Netherlands 11,100; India 10,300.
Nonmetals:			
Abrasives: Hard alloys	56	50	Bulgaria 22; Hungary 12; Rumania 6.
Asbestos	248,400	256,800	West Germany 43,500; France 30,300; East Germany 26,800; Poland 17,200.
Cement—thousand tons	2,016	2,179	Kuwait 327; Ghana 256; Poland 196.
Cryolite	3,300	3,900	Poland 1,900; Hungary 1,200.
Fertilizers and fertilizer raw material minerals:			
Apatite ore	81,600	78,800	Czechoslovakia 68,200.
Apatite thousand tons concentrates, 38.5 to 39.4 percent P_2O_5.	3,493	4,281	East Germany 786; Poland 637; Rumania 487; West Germany 471.

See footnotes at end of table.

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Table 2.—U.S.S.R: Exports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals—Continued			
Fertilizers and fertilizer raw material minerals—Continued			
Superphosphate, not less than 18.7 percent P_2O_5.	195,200	284,800	Hungary 113,600; Cuba 105,600; Bulgaria 37,800.
Ammonium nitrate	8,300	72,100	Cuba 55,000.
Ammonium sulfate	330,400	495,800	Cuba 222,900; Czechoslovakia 47,300; North Viet-Nam 39,600.
Potassium salts, KCl, 58 to 62 percent K_2O equivalent.	825,500	1,089,000	Japan 230,400; Yugoslavia 139,200; Cuba 101,400.
Graphite	6,100	8,300	East Germany 3,100; Poland 1,800; Bulgaria 1,400.
Gypsum	18,100	20,000	All to Finland.
Kaolin	1,100	300	NA.
Pyrite thousand tons	1,232	1,502	Italy 778; East Germany 241.
Refractories:			
Clay, fire resistant	16,100	15,900	Poland 10,200; Hungary 5,500.
Magnesite powder	13,200	11,700	Rumania 7,300; Japan 4,400.
Other	r 87,400	106,900	Bulgaria 32,500; Poland 18,600; Rumania 17,500.
Salt	164,500	195,200	Czechoslovakia 101,000; Hungary 48,600; Finland 31,200.
Sulfur	154,200	219,500	Cuba 76,800; Hungary 60,900; Czechoslovakia 37,500; Finland 12,300.
Sulfuric acid	63,500	91,600	Hungary 60,600; Czechoslovakia 15,000.
Talc	15,800	15,900	All to Japan.
Mineral fuels:			
Carbon black	18,081	22,791	East Germany 7,500; Czechoslovakia 3,800; Hungary 3,155.
Coal:			
Anthracite thousand tons	3,324	3,078	France 1,465; Italy 329; Czechoslovakia 316.
Bituminous do	18,831	18,589	East Germany 5,767; Bulgaria 3,047; Czechoslovakia 1,743.
Other	268	161	All to Czechoslovakia.
Total do	22,423	21,828	
Coke do	3,752	4,008	East Germany 1,487; Hungary 604; Finland 596; Rumania 592.
Gas, natural million cubic meters	391	828	All to Poland.
Petroleum:			
Crude thousand tons	43,432	50,314	Italy 8,031; Czechoslovakia 6,396; East Germany 6,114; Cuba 3,840; Poland 3,347; West Germany 3,337; Japan 2,786; Bulgaria 2,623; Finland 2,568; Hungary 2,473; Brazil 2,195; France 1,659.
Refinery products:			
Gasoline thousand tons	2,353	2,703	Poland 657; West Germany 234; Czechoslovakia 226.
Kerosine do	1,165	1,253	India 700; Czechoslovakia 250; Ceylon 177.
Gas, diesel oil do	7,361	8,289	Finland 2,353; West Germany 948; Japan 647.
Residual fuel oil do	9,709	10,637	Sweden 3,234; Finland 1,075; Bulgaria 933; Cuba 826.
Lubricants do	276	270	Cuba 74; Bulgaria 51; North Korea 31.
Bitumen do	23	30	Bulgaria 25.
Parafin do	28	30	Poland 9; Bulgaria 3.
Unidentified do	72	106	All to Communist countries.
Total do	20,987	23,318	
Power, electric million kilowatt hours	1,516	1,601	Hungary 1,252; Poland 255.

r Revised. NA Not available.

Source: Vneshnyaya torgovlya SSSR za 1966 god (Foreign Trade of the U.S.S.R. for 1966 Year), Moscow, 1967, 334 pages.

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Table 3.—U.S.S.R: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	604,800	787,200	Greece 426,900; Yugoslavia 360,300.
Semimanufactures, including those of duraluminum.	7,300	600	NA.
Cadmium, primary forms	237	182	Poland 160.
Copper:			
Ingots and equivalent primary forms:			
Unalloyed	700	7,400	NA.
Semimanufactures	5,800	5,600	All from Yugoslavia.
Iron and steel:			
Iron ore—thousand tons	12	----	
Pig iron—do	148	138	Finland 103; North Korea 35.
Ferroalloys—do	6	7	North Korea 0.8; Undisclosed 6.2.
Rolled products, excluding pipes—do	792	561	Rumania 211; Austria 98; North Korea 60.
Steel pipes—do	767	596	Rumania 208; Japan 141.
Lead:			
Ore	30,600	35,900	All from Iran.
Concentrate	------	------	
Ingots and equivalent primary forms.	47,900	31,100	North Korea 13,300; Yugoslavia 13,000; Bulgaria 4,800.
Mercury—76-pound flasks	5,800	5,200	Yugoslavia 2,900; mainland China 2,300.
Tin, primary forms—long tons	5,800	4,800	United Kingdom 2,100; Malaysia 2,000; mainland China 500.
Tungsten, concentrate	6,000	3,000	All from mainland China.
Zinc:			
Ore	12,100	20,300	All from Iran.
Concentrate	15,900	10,000	All from North Korea.
Dust	1,300	1,400	All from Poland.
Ingots and equivalent primary forms.	58,800	16,300	North Korea 8,100; Poland 4,100.
Rolled products	4,000	4,000	All from Poland.
Alloys	5,900	5,500	All from Poland.
Nonmetals:			
Barite	105,200	141,700	North Korea 60,800; Bulgaria 34,100; Yugoslavia 30,400.
Cement—thousand tons	67	311	All from North Korea.
Flurospar	116,300	94,900	Mainland China 49,700; Mongolia 45,000.
Mica	376	88	All from India.
Refractories, magnesite powder	137,900	106,400	All from North Korea.
Sulfur	25,200	27,300	Mainland China 3,000; undisclosed 24,300.
Talc	67,500	60,300	Mainland China 29,900; North Korea 16,200; Bulgaria 14,200.
Mineral fuels:			
Coal, bituminous—thousand tons	6,800	7,300	Poland 7,206.
Coke—do	662	654	All from Poland.
Petroleum: Refinery products:			
Gasoline—do	1,221	937	Rumania 648; East Germany 230.
Kerosine—do	169	48	Rumania 47.
Gas/diesel oil—do	227	144	Rumania 116.
Residual fuel oil—do	50	329	Rumania 37; undisclosed 292.
Lubricants—do	149	134	Rumania 119; Hungary 13.
Bitumen—do	66	41	All from Rumania.
Paraffin—do	12	10	All from Rumania.
Unidentified—do	10	11	All from Rumania.
Total—do	1,904	1,654	Rumania 1,018; East Germany 260.
Carbon black	9,900	1,100	East Germany 1,000; Poland 100.

NA Not available.

Source: Vneshnyaya torgovlya SSSR za 1966 god (Foreign Trade of the U.S.S.R. for 1966). Moscow, 1967, 324 pp.

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Table 4.—U.S.S.R.: Exports and imports of selected metals and minerals, by group of countries in 1966

(Thousand metric tons)

Commodity	Trading partner group					Grand total
	Communist countries		Noncommunist countries			
	CEMA [1] members	Total	Developed	Developing	Total	
Exports:						
Aluminum	137	152	95	9	104	256
Chromite ore	149	149	771	----------	771	920
Copper	88	89	31	----------	31	120
Lead	76	77	7	4	11	88
Iron ore	24,014	24,014	2,104	----------	2,104	26,118
Manganese ore	667	681	537	----------	537	1,218
Pig iron	2,118	2,336	1,848	200	2,048	4,384
Pipes	220	263	5	22	27	290
Rolled products	4,009	4,303	289	427	716	5,019
Apatite concentrate and phosphate	3,139	3,250	1,343	28	1,371	4,621
Nitrogenous fertilizer, bulk	62	380	----------	191	191	571
Potassic fertilizer, bulk	234	474	593	22	615	1,089
Coal (including anthracite)	13,392	14,505	6,994	329	7,323	21,828
Crude oil	20,998	25,501	20,292	4,521	24,813	50,314
Petroleum products	4,465	6,723	13,780	2,805	16,585	23,308
Imports:						
Copper	.1	.1	.3	7.0	7.3	7.4
Lead	4.8	31.1	----------	----------	----------	31.1
Pipes	347.0	347.0	249.0	----------	249.0	596.0
Rolled products	340.0	480.0	131.0	----------	131.0	561.0
Tin	----------	.6	2.1	2.1	4.2	4.8
Zinc	8.2	16.3	----------	----------	----------	16.3
Cement	----------	311.0	----------	----------	----------	311.0

[1] Council for Economic Mutual Assistance, which includes Bulgaria, Checkoslovakia, East Germany, Hungary, Mongolia, Poland, Rumania in addition to the U.S.S.R.

Source: Vneshnyaya torgovlya (Foreign Trade). Moscow, No. 8, August 1967, pp. 53–55.

COMMODITY REVIEW

METALS

Development of ferrous and nonferrous industries lagged behind goals foreseen in the 1966–70 5-year plan. Many products of the industry however were not up to quality and variety requirements. While production of metals and alloys continued to grow, beneficiation and metallurgical facilities still experienced poor metal recoveries. Concentrates produced from polymetallic ores of Kazakhstan contained less metal values in 1967 than in 1966.

Aluminum.—The U.S.S.R. was a large producer of low-grade bauxite, the main source of alumina in the Soviet Union, and other aluminous raw materials. Supplies however, are insufficient in both quantity and quality to meet Soviet needs; therefore considerable attention has been devoted to developing other raw materials (nepheline and alunite).

The Soviet aluminum industry imports a considerable amount of high grade bauxite and alumina from Hungary, Yugoslavia, and Greece.

Major reserves of presently minable bauxite are situated in the Turgay in Kazakhstan, on the eastern slopes of the Urals, and in the Tikhvin area of Leningrad Oblast'. About three-fourths of the reserves are in the Asian part of the U.S.S.R.

In 1967, basic attention was being paid to improving the raw material base and to erecting alumina plants. The extraction of Turgay bauxite in 1967 increased almost 40 percent compared with 1966. Development of a fourth Nizhne-Ashutskiy open pit will begin in 1968. It is planned to open three new mines in the northern Urals bauxite deposits by 1970.

Kazakhstan was the second largest alumina-producing area in the Soviet Union

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(after the Urals) and the Pavlodar alumina plant was among the nation's largest in 1967. The second stage of the plant was commissioned at the beginning of 1967, and the third stage was put into operation at yearend. It was planned to build another alumina plant in this area. Reportedly, the first stage of the Achinsk alumina plant will be commissioned in 1969. Ore for the plant will come from a nepheline mine on the border of Krasnoyarsk Kray and Kemerovo Oblast' which was to start operation in 1968. Alumina output will be sent to the Krasnoyarsk aluminum works. In 1967, about 1 million tons of alunite was extracted at the Zaglik open pit in Azerbaydzhan. The second stage of the open pit was under construction. The Kirovabad alumina plant in Azerbaydzhan started producing alumina from alunite. It was planned to produce 70,000 tons of alumina in 1968.

Construction continued on the Bratsk, Krasnoyarsk, and Irkutsk aluminum plants. A new aluminum plant in Tadzhikistan was also under construction.

Table 5.—U.S.S.R: Estimated capacity and production of primary aluminum plant

(Thousand metric tons)

Plant	Began operation	Probable annual capacity, Jan 1, 1968	Probable output	
			1966	1967
Bogoslovsk	1945	140	125	125
Bratsk	1966	100	12	37
Dneprovsk	1933	70	63	63
Irkutsk	1962	200	100	100
Kanaker	1950	75	55	55
Kandalaksha	1961	30	20	20
Krasnoyarsk	1964	200	90	110
Nadvoitsa	1954	35	25	25
Novokuznetsk	1943	160	115	135
Sumgait	1955	75	60	60
Ural'sk	1939	135	120	120
Volkhov	1932	20	15	15
Volgograd	1959	125	90	90
Total		1,365	890	965

Antimony.—Deposits of antimony occur at Kadamzhay in Kirgizia, Dzhidzhikrut in Tadzhikistan, Turgayskoe in Kazakhstan and at Tazhdolinskoe in Siberia.

Two operations in Kirgizia produced both antimony metal and compounds in 1967. During 1966–70, it is planned to increase antimony output in Kirgizia by 50 to 100 percent, by renovating the Kadamzhay Combine and completing the remodeling of the Tereksay mine. Thus, during the 1966–70, 5-year plan, Kirgizia will maintain a leading place in metallic antimony and mercury production. The Dzhidzhikrutskiy mining and concentration combine, construction of which started in 1967, will be the main Soviet supplier of antimony and mercury after 1970.

Arsenic.—Aresnic reserves are estimated at about 12 million tons with an average As_2O_3 content of 0.2 to 2.5 percent. All output in 1967 was obtained as a byproduct from the smelting or roasting of metallic ores.

Beryllium.—The Soviet Union is one of the world's largest producers and consumers of beryl, beryllium alloys, and metal.

There are numerous beryl deposits in the U.S.S.R., mainly in the Soviet Far East, Transbaykal, Kazakhstan, Central Asia, Western Siberia, Urals, Kola Peninsula, and Western Ukraine. Reserves in 1967, were estimated at about 5,000 tons of contained BeO chiefly in low-grade ores. The probable average BeO content in the ore is 0.2 to 0.5 percent.

The beryllium production schedule was being pushed rapidly. According to the 1966–70, 5-year plan, output may be increased by 50 to 60 percent, indicating a probable level of 1,500 to 1,600 tons of beryl (10 to 12 percent BeO) by 1970.

Bismuth.—In 1967 bismuth was recovered as a byproduct of lead smelting in Kazakhstan and other areas of the Soviet Union, from dust and crude lead at the Balkhashskiy and Mednogorskiy copper combines, and from tungsten and molybdenum ores. Recovery of metal in final bismuth concentrates was only about 50 percent of the metal contained in ores. The overall recovery efficiency of the entire process may be only 45 percent.

Cadmium.—Cadmium was produced at various Soviet lead and zink smelters as a byproduct. Cadmium recovery at lead and zinc plants reportedly rose by 8 percent from 70.7 percent of total content of ore to 78.7 percent during 1966–67. At the Ust'-Kamenogorsk plant the increase was 4.35 percent, and at the Electrotsink plant it was 3.0 percent for an overall recovery of 86 percent. Monthly cadmium extraction at the Chimkent lead plant rose by 15 tons. It is planned to obtain a large quantity of cadmium from

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lead slags alone. In 1967, the Ust'-Kamenogorsk lead and zinc combine increased cadmium output by almost one-fifth over the 1966 figure.

Chromium.—With an output of 1.6 million tons the U.S.S.R. was the leading world chrome ore producer and exporter in 1967. The Soviet Union's deposits of chromium ores are situated in Kazakhstan and in the Ural Mountains, where the mining of these ores was entirely concentrated. Geological reserves[5] of the U.S.S.R. were estimated at 75 million tons of ore containing 15 to 63 percent Cr_2O_3 of which 15 to 20 million tons are measured. Chromite reserves in Kazakhstan exceed reserves of the Urals. The Molodezhnoye deposit was discovered in Aktyubinsk Oblast'. A considerable part of the deposit is suitable for opencast mining.

The Donskoye mining administration in Khrom-Tau in Kazakhstan, which produced over 90 percent of the Soviet output, is the only supplier of high-quality ore in the country. In 1966, Kazakhstan ore, produced in increasing quantities every year, was exported to 8 countries in Europe, the United States, and Japan, with the non-Communist world receiving over 90 percent of the total. During the 5-year plan period (1966–70) ore exports will be increased to about 1.2 million metric tons.

Most ores were high enough in grade to be shipped without benefication other than hand picking. The benefication method used in the Soviet Union comprises primary and secondary crushing, grinding, and classification. A chromite concentrating mill, the first in the U.S.S.R., was under construction at Donskoye in 1967.

About 45 percent of the total chromite ore used in the Soviet Union during 1964–66 was consumed for metallurgical applications, the refractory industry consumed 32 percent, and the chemical industry (and others) consumed 23 percent. The Soviet demand for all uses could go to 570,000 tons by 1970, approximately 106 percent of estimated 1967 consumption. Salient statistics on chromium ore in the Soviet Union for 1963 through 1970 are as follows, in thousand metric tons:

	1963	1964	1965	1966	1967	1968	1969	1970
Production (30 to 56 percent Cr_2O_3)	1,080	1,180	1,270	1,450	1,570	1,650	1,700	1,750
Consumption (30 to 56 percent Cr_2O_3):								
Metallurgical applications	231	233	235	238	243	247	252	256
Refractory industry	164	165	167	170	173	176	179	183
Chemical industry and others	118	119	120	122	124	127	129	131
Total	513	517	522	530	540	550	560	570
Exports (48 to 56 percent Cr_2O_3)	557	663	748	920	1,030	1,100	1,140	1,180

Cobalt.—Geological cobalt reserves were estimated at about 100,000 tons of metal content, chiefly in nickel-cobalt ores, and include the high cobalt content in arsenic-cobalt ores of the Khovu-Aksinsko deposit in Tuva Autonomus Republic.

In 1967 cobalt was produced at the Norilsk, Severonikel, Pechenganikel, Yuzhuralnikel combines, at the Ufaley and Rezhsk nickel plants and also at the Balkhash copper plant in Kazakhstan. The Tuva cobalt combine was under construction, to be completed by 1970.

Cobalt extraction from ore rose by 14.1 percent from 1958 to 1965, although losses in slags remained high. In 1967 only 20 percent of the cobalt in slags was recovered. Average total cobalt recovery was about 50 percent.

Copper.—Geological copper ore reserves of the U.S.S.R. in 1967 were estimated at about 35 million tons of contained metal, chiefly in low-grade cupriferous sandstones, and porphyries in several large

[5] Geological reserves as defined by the Soviets include measured (Soviet category "A") plus indicated (Soviet category "B") plus inferred (Soviet categories C1 +C2); the major categories correspond directly to those in use in the United States.

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districts where many orebodies are suitable for surface mining. The reserves also include several million tons of high-grade pyriticpolymetallic copper ores, and a smaller quantity of copper-vanadium-titanium and other ore types.

In 1967, about 96 percent of the total copper ore was concentrated. The balance was smelted directly. Of the total 1967 Soviet production, the Urals accounted for about 45 percent and Kazakhstan for 35 percent. If the 60 percent growth in copper output projected in the 1966–70 5-year plan is achieved, the U.S.S.R. will produce close to 1.1 million tons of primary copper by 1970, with 40 percent coming from Kazakhstan and 34 percent from the Urals.

In Kazakhstan, where a 90–percent relative increase in output is envisaged by 1970, the first stages of the large, new Nikolayevskiy and Orlovskiy ore mining and benefication combines were being built. The new Dzhezkazgan copper smelter and electrolytic refinery were being enlarged. It is assumed that the additions will begin production in 1970.

Despite improvements in recent years in the Soviet copper industry, the situation with respect to utilization of complex raw materials remained unsatisfactory. Considerable amounts of metals were lost at the concentrating plants; capacity of shops for processing smelter flue dust was inadequate, and there were no facilities for reprocessing dumped slags.

Gold.—In 1967 the U.S.S.R., with 5.7 million ounces was probably second among world gold producers. About three-quarters of the total output came from East Siberia and the Soviet Far East (mainly from placer deposits at Kolyma, Aldan, Dzhugdzhur, Indigarka, Yana and Chukota); most of the remainder came from gold and polymetal ores as well as placers in Kazakhstan, the Urals, and Armenia. Alluvial deposits contributed 67 percent of total 1967 output.

Geological reserves of gold in ore and placers deposits in the U.S.S.R. were estimated at about 200 million ounces in 1967.

During 1959–65 gold output in Magadan Oblast' in the Soviet Far East rose by 86 percent. This main center of Soviet gold production, where, 32 mines, 18 dredges, and 100 sandwashing plants were in operation fulfilled its plan in 1967 by 103.2 percent. It is planned to increase gold production during the 1966–70 5-year plan in Magadan Oblast' by over 40 percent.

Gold output in Yakutia increased by 40.4 percent during 1959–65. In 1967, there were 363 bulldozers and 147 washing rigs in operation in Yakutia. Aldan gold combine fulfilled its 1967 annual plan of gold output by 104.6 percent, and Indigarka mining industry administration by 108.9 percent.

Within Yakutia, the Lenzloto trust was a leading gold-dredging enterprise. During 1966–70 it is planned to increase production at this trust by 60 percent and to launch seven dredges, including the world's largest. Reportedly this dredge, slated to be 236 meters long and to have 69 buckets of 600 liters' capacity each, will be able to operate to a depth of 50 meters. The dredge requires a crew of 10 men.

During the current 5-year plan production of gold is to be increased in Amur Oblast', Khabarovsk Kray, the Transbaykal area, Kamchatka, Kazakhstan, the Urals, Armenia, Uzebeistan, and other regions of the U.S.S.R.

Iron Ore.—At yearend 1967, iron ore reserves in the U.S.S.R. totaled 109,700 million tons containing an average of 34.8 percent iron; of this, 40,400 million tons were at the Kursk magnetic anomaly. However, a substantial part of the anomaly's reserve is at great depth and would require costly underground operations under very difficult mining conditions.

Of total national reserves, those in categories A plus B plus C_1 (measured, indicated and part of inferred) were estimated at 56,100 million tons with an average iron content of 38.4 percent, including 10,300 million tons of ore not requiring dressing with an iron content of more than 55 percent, and 34,800 million tons of easily dressed iron ores. All the main industrial regions of the U.S.S.R. have large iron ore reserves available.

There were 69 open pit and 66 underground mines with a total capacity of about 180 million tons of usable ore in operation in 1967. About 75 percent of the ore production was from open pits;

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nearly half of this was from only six pits, each producing over 10 million tons a year. Half of the open pits required hard rock mining, and the overall average overburden to ore ratio was about 3.5 to 1. The average iron content was 35.8 percent in crude ore and 57.5 percent in usable ore (including concentrates). Compared with 1966, production of usable ore in 1967 increased by 7.7 million to 168 million tons. Of the 1967 total, over 20 million tons was in the form of concentrates. In 1967, facilities for mining 12.6 million tons of ore were put into operation, compared with a planned addition of 32.6 million tons. The Soviet target for 1970 is 375 million tons of crude ore or 211.5 million tons of usable ore.

The Krivoy Rog basin in the Ukraine produced over 50 percent of the nation's iron ore in 1967. Here, average iron content of mine-run ore was 28 to 30 percent for taconites, and 47 to 69 percent for hematites. Concentrates from ore-dressing plants of the Krivoy Rog basin contained 62.9 percent iron in 1967. There were 10 underground mines and five open pits with a total capacity of about 100 million tons of usable ore. Almost equal tonnages of ore were produced from underground mines and open pits. The Gigant iron ore mine of this basin, the largest in the U.S.S.R., has not yet reached its plannned capacity of 7 million tons of crude ore per year.

In 1967, the Urals was the second center of Soviet iron ore production. Kazakhstan ranked third among iron ore producing regions, followed by West Siberia, the Kursk magnetic anomaly, and the Kola Peninsula.

By commissioning a pellet factory at TsGOK (Central Mining and Concentrating Combine) in the Krivoy Rog basin, and using the capacities at the Sokolovsk-Sarbaysk GOK, pellet production reached 2.9 million tons in 1967, compared with 1.6 million tons in 1966.

Iron and Steel.—In 1967 the iron and steel industry made a number of additions and some improvements in facilities. Newly constructed facilities included three blast furnaces (two with a volume of 2,000 cubic meters each and one of 2,700 cubic meters at the Krivoy Rog plant), a converter at the Nizniy-Tagil plant, a "1,700" sheet mill at the Karaganda plant, four continuous-casting shops, and one pipe mill.

The 1970 target for Soviet steel production is 124 million tons. It is planned to produce 150 million tons of steel in 1975 and some 200 million tons of steel in 1980. Product in 1967 was 102 million tons. Nearly 50 percent of steel produced by Soviet metallurgical plants was made from ferrous scrap.

The Ukraine, with Krivoy Rog, Zaporozhye, and the Donets basin as the main centers, produced about 50 percent of total Soviet pig iron, over 40 percent of total ingot steel, and some 53 percent of total rolled products. The second center was the vast area of the R.S.F.S.R., including the Urals, Center, and Siberia Regions. Kazakhstan ranked third in Soviet ferrous metal production.

There were more than 50 scientific-research and design institutes in the Soviet ferrous industry. Nonetheless development of iron and steel industry was lagging behind targets set by the 23d Congress of the Communist Party of the Soviet Union (C.P.S.U.).

The return on investment in terms of production worsened, primarily because plants were not completed on schedule and because projects were put into service that were far from complete. Tardy attainment of capacity production in a number of projects markedly increased construction costs. In 1967, 45 blast furnaces, 78 rolling mills, and three pipe mills were working below rated capacity. Actual performances of the new large blast furnaces, converters, and rolling mills were much lower than rated capacities. Also labor productivity and production cost targets were not achieved.

Soviet metallurgical plants had a considerable proportion of auxiliary workers in production shops. Spare parts and components for machines and metallurgical equiment were produced in primitive workshops with obsolete equipment. As a result, there were many more repair workers than workers in operations comprising steel smelters, blast furnaces, and rolling mills. In 1967, there were 1.27 million "production workers" (8 percent more than in 1965), 72,000 university graduate engineers, and 121,000 technicians with a professional secondary education in the Soviet ferrous industry (including iron ore min-

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ing). There were 750,000 employees (including 15,840 university graduate engineers) in the Ukrainian ferrous metallurgy industry alone.

Pig Iron.—There were 37 pig iron shops with 131 blast furnaces in operation in 1967. Reportedly, the average blast furnace capacity was 1,034 cubic meters.

In 1967, natural gas was used to produce 63.2 million tons of pig iron, and oxygen was used in the blast in the production of 30.9 million tons. However, Soviet sources indicated that although oxygen was used for blast enrichment and production increased, unit costs did not decline.

A 2,700-cubic-meter blast furnace, claimed to be the world's largest, was put into operation at the Krivoy Rog plant on October 28. This furnace was scheduled to use oxygen-enriched blast, but the oxygen unit was not completed and it is planned to come into operation in October 1968.

Steel.—In 1967, steel production increased by 6 percent, reaching 102.2 million tons. Distribution of production by process follows (in million tons):

Process	1960	1965	1967
Open hearth	55.1	76.5	81.8
Oxygen converter	2.5	4.0	9.3
Bessemer	1.9	1.9	1.9
Electric steel	5.8	8.6	9.2
Total	65.3	91.0	102.2

In 1967, there were about 400 open-hearth furnaces in operation, with an average capacity of 225 tons. About 150 furnaces were operated with addition of oxygen to the blast. Over 50 million tons of steel were produced with the application of oxygen in open hearths, and about 58 percent of total national output was produced with application of natural gas.

Oxygen-converter shops were in operation at five metallurgical plants in 1967. Converters of 100-ton capacity were in use.

The share of steel smelted in oxygen converters was not great because of several problems, the main one being automatic control of smelting processes. Existing oxygen-converter shops did not reach rated capacities. Their steel was more expensive than open-hearth steel, and labor productivity in these shops was lower than in the open-hearth furnaces.

At many plants outside the U.S.S.R., the life of tar-dolomite refractory linings was 400 to 600 melts, and refractory consumption was 3 to 4 kilograms per ton of steel. Corresponding figures for the Il'ich plant in Zhdanov in 1967 were 160 melts and 15 to 18 kilograms.[6] The low stability of the lining led to long idle times of the converters. Cost of refractories was prominent in the cost of steel.

New converters were under construction at the West Siberian, Yenakievo, Karaganda, Krivoy Rog Lenin, and Chelyabinsk plants. The country's first oxygen converter, with a capacity of 250 tons, was being built at the Zhdanov heavy machine building plant in the Ukraine. Reports indicated that several thousand workers were engaged in the construction of oxygen converter at Karaganda.

Semimanufactures.—Output of rolled products increased by 4.5 million tons to 71.8 million tons in 1967, and was 6.7 percent greater than in 1966. Because many Soviet rolling mills have been designed for single products, many enterprises did not fulfill the plan for product-mix. The Orsko-Khalilovo combine, the Cherepovetsk plant, the Dzerzhinskogo plant, the Krivoy Rog plant, and others did not meet delivery schedules.

In 1967, 10.6 million tons of steel pipe was produced, 7 percent more than in 1966. However, the industry did not satisfy the demands of all sectors of the Soviet economy.

Lead and Zinc.—In 1967, capital investments in the lead-zinc industry were directed toward expansion and renovation of the existing Achisay, Zyryanovsk, and Leninogorsk mining and concentrating enterprises in Kazakhstan, the Altyn-Topkan Combine in Uzbekistan, and a number of enterprises in the RSFSR.

According to the 1966–70 5-year plan, national zinc production in 1970 is to be 1.6 to 1.7 times that of 1965. Production of zinc in Kazakhstan is to be increased 90 percent and that of lead 40 percent. During this period, construction of the new Karagalinskiy Combine in central Kazakhstan, which will utilize nearby lead-

[6] Rabochaya gazeta (Worker Gazette). Kiev, Mar. 7, 1968, p. 3.

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barite ores will be completed. It is planned to complete construction of a new zinc plant in Uzbekistan, and to start mining the lead from the Gorevskiy deposit in East Siberia.

Crude lead output from metallurgical dust has been started at several copper combines.

Magnesium.—Five magnesium plants with a combined annual capacity of about 50,000 metric tons were in operation in 1967. It was planned to increase production of magnesium in 1968 by 10 percent over that of 1967. The Solikamsk magnesium works was installing continuous refining furnaces, and the first stage of a mechanized line for processing magnesium alloys.

Reportedly, a new deposit of magnesite was recently prospected near Dnepropetrovsk in the Ukraine.

Manganese.—The Soviet Manganese industry remained the largest in the world. In 1967 output of marketable manganese ore was 7.2 million tons, compared with 7.0 million tons in 1966. Mine-run ore production in 1967 was about 17.5 million tons, 70 percent from the Nikopol' manganese basin in the Ukraine. The second center of manganese activities was the Chiatura basin in Georgia, and Kazakhstan was third.

There were 18 underground mines and nine open pits in operation in the Nikopol' basin in 1967, where the ore averages 26.4 percent manganese. Concentration by gravity and agglomeration produces three products, with an overall recovery of 74 percent of the manganese in mine-run ore. Of total production, 45 to 48 percent had a manganese content of 45.6 percent, with the balance containing less than 34.2 percent Mn. Tailings contain 12 to 15 percent manganese.

In 1967, production costs of ore delivered from the best mechanized open pits to the concentrators, including stripping costs, were as follows, in rubles per metric tons:[7]

Open pits	Production costs	
	Planned	Actual
Shevchenkovsk	2.82	8.60
Grushevsk	3.49	8.07
Bogdanovsk	3.08	5.30
Alekseyevsk	2.40	3.63
Basansk	4.20	8.47

In 1967, labor productivity in the Nikopol' basin was 3 tons per man-day in underground mines and 9 tons per man-day in open pits.[8]

Ore grade at the Chiatura manganese basin averaged 23 percent, and recovery of manganese was 74.7 percent in 1967. Of total beneficiated Chiatura output, 66 percent contained 48.7 percent manganese, and 34 percent contained 25.6 percent manganese.

Mercury.—At the U.S.S.R.'s largest mercury deposit in Kirgizia there were four mines and a mercury recovery plant in operation in 1967. The Nikitovskiy Mercury Combine in the Ukraine was the second major producer.

The 1966–70 5-year plan calls for Soviet mercury output in 1970 to be 1.5 times the 1965 level. During this period, mercury output in the Kirgiz S.S.R. is to be increased to 1.3 times the 1965 level, by renovating and enlarging the Khadarkan Combine. The Novaya mine of this combine was under development in 1967.

New mercury ore reserves in the Nikitovskiy deposit in the Ukraine will serve as a base for expansion of the Nikitovskiy Mercury Combine. Expansion is to be completed by 1970, and underground mining is to be replaced by open cast. Also in the Ukraine, planning began for the Zakarpatskiy Mercury Combine, which will process ores from the Borkutnoye, Shayanskoye, and other mercury deposits in Zakarpatskaya Oblast'.

The Plamennyy mercury mine in Chukchi National Okrug in the Soviet Far East was put into operation in August 1967, and a metal recovery plant is to be built by 1970. Construction began on the Dzhidzhikrutskiy ore mining and dressing combine in north Tadzhikistan. It will comprise an underground mine, a dressing plant, and a metallurgical works. The combine will be the chief Soviet supplier of mercury and antimony. A mercury mine was under development in the Malyy Kavkazskiy Range in Azerbaydzhan, where a cinnabar deposit was discovered recently.

Molybdenum.—Reserves of molybdenum in ore (molybdenite, copper-molybdenum, and tungsten-molybdenum ores) in the

[7] Gornyy zhurnal (Mining Journal). Moscow, No. 1, 1968, p. 19.

[8] Metallurgicheskaya i gornorudnaya promyshlennost' (Metallurgical and Metal Mining Industry). Kiev, No. 5, 1967, p. 61.

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U.S.S.R. may approach 200,000 tons. Soviet output of molybdenum-in-concentrate was estimated at 7,000 tons in 1967. About 50 percent of this production was from copper-molybdenum ores from Armenia, Kazakhstan, and Kialykh-Uzen (Siberia); about 30 percent was from molybdenite ore mined in Uzbekistan and at Umaltinsk and Caikoysk in Siberia; the remainder was from tungsten-molybdenum ores of Tyrny-Auz (Kabardin A.S.S.R.) and Dzhida in Buryat A.S.S.R.

Armenia occupied first place in the production of molybdenum concentrate which was shipped out of the Republic for further processing.

The Tyrny-Auz tungsten-molybdenum combine in Kabardin A.S.S.R. is to be enlarged by 50 percent in the near future. Several million tons of ore will be extracted and processed yearly from three new mines. The Sorskiy molybdenum combine in Krasnoyarsk Kray in Western Siberia became one of the leading individual molybdenum enterprises of the U.S.S.R. in 1967.

Nickel.—Next to Canada, the U.S.S.R. was the world's largest nickel producer in 1967, with an estimated 100,000 tons of smelter product. Known reserves in the Soviet Union are not likely to exceed 5 million tons of contained nickel metal, about half of which consist of low-grade silicate ores. Some 50 percent of total reserve is in cupriferous pentlandites containing commercially recoverable copper, cobalt, and platinum-group metals. The bulk of the reserves are in three areas: Norilsk in Siberia, the Urals, and the Kola Peninsula. There are some ores in the Caucasus, Ukraine, Chukota Peninsula, and other regions.

Six smelters were in operation in 1967; Ufaley (Urals), Rezh (Urals), Khalilovo (South Urals), Monchegorsk (Kola Peninsula), Pechenga (Kola Peninsula), and Norilsk (North Siberia). Norilsk was the foremost producer of nickel, the Urals a close second, and Kola Peninsula third. Nickel production cost was highest in the Urals.

Platinum.—The U.S.S.R. remained the world's largest platinum-group metals producer. Reserves are adequate to maintain current production for many years. The most important Soviet platinum deposits are located in Norilsk, Kola Peninsula, and the Urals. Norilsk average sulfide ores contain 1.25 percent nickel, 2 to 3 percent copper, and up to 10.6 grams per ton of platinum-group metals. The nickel content of Kola Peninsula ores ranges from 1.5 to 6 percent and averages 2 to 3 percent, together with 1 to 3 percent copper and gold, silver, palladium, and platinum values.

Production was principally from Norilsk copper-nickel mines with additional output from Severonikel and Pechenganikel combines, and some placer deposits of the Urals. Virtually all platinum and platinum-group metals were produced as byproducts. The Norilsk refinery was put into operation in 1943. From 1948 through 1966 gross output of platinum-group metals increased 10 times. Reportedly, the refinery facilities continued to experience high recoveries of metals (99.93 percent in 1967). The platinum-group metals output in 1970 is expected to be 60 percent greater than in 1965. In 1967, construction was in progress at the Talnakh mining combine in Norilsk, and the second part of the Zhdanovskiy ore concentration plant of the Severonikel Combine in Monchegorsk. In 1967, the Urals produced about 10 percent more placer platinum than in 1966.

Silver.—Almost all silver was produced as a byproduct of nonferrous metals. In 1967, 14 gold ore mills extracted silver. The Norilsk combine and some copper-nickel enterprises in the Kola Peninsula were also producing silver. The Sikhali ore mining and concentrating combine in Primorskiy Kray, one of the largst producers of silver, fulfilled 1967 planned output. Metallurgical recovery of silver in beneficiation plants in the Urals was 16 to 50 percent from ores containing 6 to 15 grams of silver per ton.

A rare silver placer deposit has been discovered at Kolyma in the Soviet Far East.

Tin.—Production of tin continued to be inadequate to meet internal demand, and between 15 and 20 percent of requirements had to be imported in 1967. Soviet tin consumption in 1965 was nearly twice the 1955 level and may increase to 2.3 times the 1955 level by 1970. It is planned to increase tin production by 1970 to 1.6 times the 1965 level.

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The Soviet Far East, Yakutia, and Transbaykal were main regions of tin production. In 1967, 26 percent of total tin output was from placer deposits. In the Soviet Northeast, placers accounted for 75 percent of this area's output.

In 1967 four mines were operating in Magdan Oblast'. The Ebe-Khaya deposit in the Yakut S.S.R. came into operation during the year. This deposit was discovered in 1937 but was not mined because of its inaccessibility.

Soviet geological tin reserves have been estimated to contain about 800,000 tons of metal. The average content in ore varies from 0.6 percent to 1.0 percent of Sn.

In 1967, three new shafts were commissioned at the Solinskiy, Tsentral'nyy, and Khrustal'nyy ore mines, and two new mines—the Zapadnaya and Yubileynyy—were added to the enterprises of Khrustal'nyy mining and concentrating combine in Primorskiy Kray. The combine, which is one of the largest enterprises of the Soviet tin mining and concentrating industry, will be enlarged during 1966–70. Two new tin ore deposits were made available for exploitation to this combine in 1967, and one of these will start producing ore in 1968. A draft project on development of a new mine—the Ternistyy ore mine—in Primorskiy Kray was approved in January 1967. Development of this mine is to be completed in 1970. After its commissioning, tin production by the Dal'olovo (Far East Tin) Trust will increase by 48 percent by 1970.

The Solnechnyy mining and concentrating combine in Khabarovsk Kray started production in January 1967. With completion (by 1970) of this combine, which is the largest tin mining and concentrating combine in the Soviet Union, Khabarovsk Kray will be one of the prime tin producers in the U.S.S.R. The second stage of the Sherlovogorskiy mining and ore dressing combine in the Transbaykal area was under construction and was planned to be completed in 1968, at which time the combine's tin output would increase by 50 percent.

The Novosibirsk tin smelter's 5-year plan envisages a 54-percent increase in its tin output. Concentrates from other areas are shipped to this plant.

Titanium.—With 10,000 tons the U.S.S.R. was the world's second largest producer of titanium in 1967. The existing Soviet titanium industry developed largely in the last 8 years. During 1966–70, a 140 percent increase in Soviet titanium output is planned.

The titanium industry of the U.S.S.R. is based mainly on Ukrainian and Siberian ilmenite and rutile, and on titaniferous magnetites and ironstones situated mainly in the Central Urals, Kola Peninsula, and Karelia. Soviet geological reserves of titanium have been estimated at about 10 million metric tons of TIO_2 content (some 70 million tons of ore with an average 10 to 20 percent TiO_2).

In the Ukraine, the nation's center of titanium production, major producers were the Samotkanskoye zirconium and titanium alluvial deposit and the Volchanskoye titanium deposit in Dnepropetrovsk Oblast'; the Irshinskoye, Streminogorskoye, and Zelenogorskoye titanium deposits in Zhitomirskaya Oblast'; and the Tarasovskoye titanium deposit in Kievskaya Oblast'. Two combines, the Irshinskiy Mining and Beneficiation Combine, and the Verkhnedneprovskiy Mining and Beneficiation Combine, operate these deposits. In 1967, at the Irshinskiy combine, dredges were used for the first time in the Ukraine for ilmenite extraction. The Verkhnedneprovskiy combine is the main raw material supplier for the Soviet titanium industry.

In 1967, No. 3 concentrator was under construction in Irshinskiy. During 1966–70, the Irshinskiy combine is to commission No. 3 as well as No. 4 beneficiation plants, and to triple total output.

Tungsten.—For the first time, the U.S.S.R. production of tungsten, 13,000 tons, was enough to provide for the growing domestic needs. Soviet tungsten industry development was concentrated in the Soviet Far East, Transbaykal, Central Asia, Kazakhstan, and North Caucasus.

A rich wolfram deposit has been discovered in Maritime Kray. A combine called Vostok (East), which was under construction in 1967 and will be one of the largest nonferrous metal enterprises in the Soviet Union, is scheduled to begin operation in 1970. In addition to wolfram mines, the combine will include a beneficia-

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tion plant. The Iultin mine in Magadan Oblast' was being modernized. The sixth section of the Tyrny-Auz tungsten and molybdenum combine in North Caucasus was under construction.

The 5-year plan includes the development of the Orlovskiy ore mine in Chita Oblast', which will be used as a basis for building the Orlovskiy concentrator. It is planned to build a second beneficiation plant at the Dzhidinskiy tungsten and molybdenum combine in Buryat A.S.S.R.

A tungsten ore deposit was discovered in the Chukchia National Okrug (Magadansk Oblast').

Uranium.—Uranium is relatively plentiful in various parts of the Soviet Union. According to Soviet sources, the Novaya uranium mine at Zheltye Vody in Dnepropetrovsk Oblast' in the Ukraine is a large producer. Several mines operated in the mountains of Tien Shan', Uzbekistan, in 1967. The U.S.S.R. is offering uranium and thorium compounds for export in commercial quantities and qualities.

Vanadium.—Soviet vanadium production did not provide for domestic needs, and for several years the U.S.S.R. imported vanadium pentoxide from Finland. The principal domestic sources of vanadium in 1967 continued to be the titaniferous magnetites of the Kachkanar mining and concentrating combine in the Urals. The Soviets claim that the Kachkanar deposit is one of the largest in the world. However, metallurgical problems of vanadium recovery have not been satisfactorily solved, and rated vanadium recovery has not been achieved. As a result, the Soviet economy experienced a vanadium shortage in 1967.

The Kachkanar mining and concentrating combine, with a capacity of about 16 million tons of crude ore was in operation in 1967. The plan for developing in 1967 an additional 8.25 million ton crude ore capacity was not fulfilled. The combine was delivering concentrate containing iron and vanadium in 1967, however, some titanium and platinum in the concentrates were being irretrievably lost.

Minor Metals.—During 1959–65, the U.S.S.R. began industrial production of virtually all of the rare metals and built the necessary recovery facilities at primary plants as well as nonferrous metal plants. The growth in the quantity index exceeded the growth of the quality indexes, and the extraction of many rare metals was very low.

By product gallium is recovered, from nepheline raw materials used to produce aluminum.

The new Soviet semiconductor materials industry was meeting the demands of its indigenous customers and beginning to export germanium and silicon.

The Soviets first experimental installation for extracting rhenium was completed at the Dzhezkazgan mining and metallurgical combine in February 1966. The first industrial recovery of rhenium in the U.S.S.R. was at the Balkhashskiy copper smelting combine in June 1966, where rhenium salts are recovered from reprocessing of molybdenum plant byproducts and from sulfuric acid plant washings.

By 1965, selenium and tellurium extraction in the U.S.S.R. was organized at the Norilsk Combine, where they are recovered at the electrolytic copper plant. Selenium was also extracted at the nonferrous enterprises of Kazakhstan, the Urals, and Armenia. The sulfuric acid shop, which is to produce "several tons" of selenium from the slimes, was under construction at the Severonikel (Kola Peninsula) in 1967, where selenium and tellurium were already recovered at the electrolytic copper plants.

The bulk of tantalum and columbium in the U.S.S.R. is in pyrochlore (Kola Peninsula, Urals), obruchevite (Kola Peninsula, Ukraine), and in hetchettolite (Kola Peninsula, Khiba, and others).

A number of large newly discovered deposits of low-grade tantalum-columbium ores in granites also contain accumulations of other rare metals. Some granites contain up to 0.05 percent Ta_2O_5 with the Ta_2O_5-to-Cb_2O_5 ratio as high as 2. The average Ta_2O_5 content in the tops of granitic massifs, as a whole, may be as high as 0.015 percent.

The growing need for tantalum necessitates processing ores and concentrates with a low content of this metal. However, there is great difficulty in processing such raw material with existing Soviet technology.

Soviet production and consumption of tantalum-columbium mineral concentrate is estimated to have doubled during 1959–65, mainly owing to a new process for the separation of tantalum from titanium.

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Several enterprises exploited zirconium alluvial deposits in 1967. One of the largest is the Samotkanskoye zirconium deposit in Dnepropetrovsk Oblast', Ukraine. The Verkhnedneprovskiy Mining and Metallurgical Combine was put into operation in 1961 to mine this deposit. Installations for the production of zirconium went into operation in February 1966 at two nonferrous metal enterprises.

NONMETALS

Production of practically all nonmetallic minerals continued to rise, and the 1967 output was nearly 8 percent above that of 1966. For many nonmetals U.S.S.R. production is adequate for its needs, but high-quality barite, fluorspar, mica, and talc were apparently in short supply.

Asbestos.—In 1967, the U.S.S.R. produced an estimated 769,000 tons of asbestos, a considerably lower figure than that published in other sources. This output estimate is based on presumed fulfillment of planned 1967 production of six grades of asbestos as given in Problem of Economics (Voprosy ekonomiki) No. 9, 1968, p. 76. Higher figures for total asbestos output published elsewhere include sizable tonnages of lower grade materials, but these have been discounted in determining Soviet output estimates appearing in Table 1. This follows the practice of the State Commission for Reserves (G.K.Z.), as indicated in Soviet Geology (Sovetskaya geologiya), No. 7, 1968, p. 157, which states that the seventh grade was not included in total reserve calculations and that asbestos combines were relieved of the responsibility for extracting such lower grade material. It has been indicated that the lower grade material is used as railway track ballast and in other applications not really requiring the use of asbestos.

Soviet chrysotile asbestos development was concentrated in the Urals, mainly at Asbest, with smaller open pits near Alapayevsk, Nizhniy Tagil, and south of Sverdlovsk. Asbestos centers were under development at Dzhetygara in Kustanay Oblast' (northwest Kazakhstan), Aktovrak (Tuva A.S.S.R.), Kiyembay deposit, 80 kilometers southeast of Orsk (South Urals), and Molodezhnoe and Il'chirsk (Buryat A.S.S.R.).

For some time anthophyllite and other nonchrysotile varieties of asbestos have been mined at a small Sysertsk deposit in the Urals. Some new deposits were discovered recently in the Urals and Kazakhstan. Exploration of the Bugetysaysk deposit in Mugodzhary hills (Kazakhstan) was completed in 1967. It is planned to develop this orebody in the near future.

Output of six grades of chrysotile asbestos at Uralasbest combine (the largest in the U.S.S.R.) was 633,200 metric tons in 1967. Explored reserves of Uralasbest deposits were reported at 38.7 million tons. No. 6 asbestos mill at this combine was not completed in 1967, because it was not fully staffed owing to lack of housing. Management wanted 7,000 workers and there was housing for only 5,000.[9]

In Kazakhstan a large combine has been organized for exploiting the Dzhetygara deposit which is the second largest in the Soviet Union. The Dzhetygara asbestos combine, which was a 7-year plan (1959–65) priority construction project, started operation in 1965. It is located on a large deposit of chrysotile estimated as sufficient for many decades. The first stage of the combine, with 200,000 ton annual capacity was commissioned in October 1965. The combine produced some 20,000 tons in 1965 and worked at one-third of its planned capacity in 1966, producing approximately 70,000 tons. In 1967, 112,300 tons was produced, and 6,000 workers were employed.

In April 1965, construction started on the second stage of the Dzhetygara asbestos combine (400,000 tons annual capacity) and it is to be commissioned by 1970. The combine will achieve designed annual capacity of 600,000 tons when both stages reach full capacity at which time it will be one of the largest asbestos production enterprises in the U.S.S.R.

The first stage of the Tuvaabest combine at Aktovrak in Tuva A.S.S.R. was put into operation in 1966. In 1967, the second stage was under construction, scheduled to go into operation in 1970.

In the north Buryat A.S.S.R. detailed exploration of the Molodezhnoe deposit was completed. The deposit was estimated to contain several million tons of asbestos.

A deposit of long-fiber asbestos has been discovered in the Tuva Autonomous Re-

[9] Stroitel'naya gazeta (Construction Gazette). Moscow, Aug. 18, 1967, p. 1.

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public. The reserves and quality of the asbestos exceed those of the well-known Aktovrak deposit.

Salient statistics on the Soviet asbestos industry under the 1967 plan were as follows:

	Combine			Total
	Uralasbest	Kustanayasbest	Tuvaasbest	
Output of fibers thousand metric tons	633.2	112.3	23.6	769.1
Fixed assets million rubles	181.0	59.9	21.6	262.5
Total production cost do	55.8	14.5	4.3	74.6
Total selling cost	132.6	16.8	5.3	154.7
Profit do	76.8	2.3	1.0	80.1

Source: Voprosy ekonomiki (Problems of Economics). Moscow, No. 9, 1968, p. 76.

Diamond.—The U.S.S.R. continued to make rapid progress in expanding its diamond industry which was centered in Yakutia. So far, about 20 diamond deposits have been discovered in this autonomous republic. These, however, cannot be fully exploited before the Vilyuy hydroelectric station is in full operation which is expected to be by 1970.

Production of diamonds in Yakutia started at a small concentrating plant in 1957. On January 1, 1968, the combine established the large mechanized Mirnyy open pit and five concentrators, the Aykhal open pit and one concentrator, the Udachnaya placer mine and one concentrator (put into operation on August 28, 1967), and the Irelyakh placer mine with two dredges. In 1968, the Soviets planned to complete modernizing and enlarging the concentrator at the Aykhal pipe.

By 1970, Yakutia's diamond output is to be increased by about three times in comparison with 1965 level. Two more concentrating mills are to be built, at Aykhal and Udachnaya, to process deeper horizons.

At present about 80 percent of Yakut diamond output is used for industrial purposes and 20 percent for jewelry. Near Mirnyy a new diamond pipe was recently discovered which was named after the 23d Congress of the CPSU.

The Vishera River region in Perm' Oblast' (Western Urals) was the second producer of diamonds. At two placer deposits four dredges and two separation plants were in operation in 1967. Diamonds of the Vishera deposits are suitable for both industrial and jewelry purposes. New dredges will go into service in the north of the Oblast' to increase the extraction of diamonds.

In 1967, 50 percent of Soviet diamonds were produced from placer deposits.

Fertilizer Materials.—The Soviet Union produced 40.1 million tons in bulk fertilizer content in 1967.[10] An increase of 10.5 percent in output is expected in 1968. Compared with 1966, U.S.S.R. mineral fertilizer output in 1967 increased over 4.2 million tons, or 11.7 percent. However, despite the substantial production and large exports, fertilizers were in short supply, and the quality of mineral fertilizers produced did not meet domestic consumers demands.[11] In 1967 capacities for 3.1 million tons of fertilizers were added.

Phosphate.—Geological reserves of phosphate were estimated in 1967 at 2,700 million tons of phosphate rock (overall average grade, 13.8 percent P_2O_5) and 2,717 million tons of apatite (average grade, 18.5 percent P_2O_5).

Phosphate rock production totaled 36.2 million tons in 1967, including 21.2 million tons of apatite ore (17.7 percent P_2O_5) and 15 million tons of sedimentary rock (13 percent P_2O_5). The main centers of phosphate rock output were the "Apatit" combine on the Kola Peninsula and phosphorite deposits of Karatau in Kazakhstan, Kingisepp in Leningrad Oblast', Egor'evsk in Moscow Oblast', Upper Kama in the Urals, and others.

[10] The active ingredients (nitrogen, phosphorus, and potash) are expressed in term of Soviet standard units which are not the same as used in the United States. Nitrogen is expressed as ammonium sulfate, phosphate is expressed as 18.7 percent P_2O_5, potash is expressed as 41.6 percent K_2O and ground rock phosphate (phosphatic flour) is expressed as 19 percent P_2O_5.

[11] Khimicheskaya promyshlennost' (Chemical Industry). Moscow, No. 1, 1967, pp. 8–9.

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The apatite-nepheline deposits of the Khibiny in the Kola Peninsula comprised the U.S.S.R.'s largest single phosphate source. Mined ore, averaging 16 to 21 percent P_2O_5, was concentrated up to 39 percent P_2O_5 with 92 percent recovery. The two beneficiation plants had capacity of 9.5 million tons of concentrate per year, while four mines (three underground and one open pit) had an annual capacity of 21.5 million tons of crude ore in 1967. An output of around 30 million tons of crude ore is planned for 1970 to yield 12.4 million tons of concentrate.

The 40 commercial deposits in the Karatau Mountains in Kazakhstan contain about 1,700 million tons of phosphorite containing 23 to 26 percent P_2O_5, over half requiring underground mining. A beneficiation plant was put into operation in 1964, but because of poor technology, only 30 to 32 percent of planned capacity was achieved in 1967; the concentrates contained 28.5 percent P_2O_5. Annual losses at the Karatau Combine are about 9 million rubles.[12] It is planned to extract 8 to 9 million tons of crude ore at the Karatau in 1970.

The Kingisepp "Phosphorit" combine in Leningrad Oblast,' the second largest producer of phosphorite in the U.S.S.R., produced over 1 million tons of phosphatic flour in 1967. It is planned to produce over 1.5 million tons in 1968. Yegor'evsk and Lopatino deposits in Moscow Obast' were the third important area of Soviet phosphorite activities. The average grade of mined ore was 10 to 17 percent P_2O_5; after washing it contained up to 24 percent P_2O_5.

The production cost for Khibiny apatite was 16 rubles and 76 kopeks per ton of contained P_2O_5 produced; at the Karatau Combine it was 35 rubles and 19 kopeks in 1967. The planned production cost for 1 ton of contained P_2O_5 was 22 rubles and 82 kopeks.

Potassium.—The Soviet Union is one of the world's leading countries in potassium ore reserves and in potassium fertilizer output. Geological reserves of potassium ores were reported in 1967 at 19,600 million ton with 16 to 40 percent K_2O content. About 70 percent of these reserves are in the Upper Kama basin in the North Urals. The reserves are principally carnallite and sylvite with a 13- to 20-percent K_2O equivalent. Recent investigations have disclosed the existence of large reserves of sylvinite. The second largest reserve region is Starobinsk in Belorussia. The Starobinsk basin contains sylvinite (16- to 20-percent K_2O), with 4- to 9-percent insoluble material. The third important basin for potassium output is in L'vov Oblast', in the Western Ukraine. The most important potash mineral is hartsaltz (16 percent K_2O), with some deposits of carnallite, polyhalite and langbeinite.

The following potassium combines were in operation in the U.S.S.R. in 1967: Solikamsk, Bereznikovsk No. 1 (Ural), Soligorsk No. 1, first stage of Soligorsk No. 2 (Belorussia), and first stage of Novo-Stebnikov (L'vov Oblast', Ukraine). New capacities put into operation in 1967 include the first stage of the Kalush Combine in the Ukraine and the second stage of Soligorsk No. 2 in Belorussia. Bereznikovsk No. 2 and No. 3 and Soligorsk No. 3 were under construction in 1967.

In 1967 about 2.75 million tons of potash was produced, 11 percent more than in 1966; this was attained entirely through commissioning new capacities. Estimated Soviet output by 1970 will be some 5 million tons of K_2O equivalent. The Soligorsk Potassium Combine No. 1, in Minsk Oblast' (Belorussia), which produced about 6.5 million tons of potash ore in 1967, employed around 5,100, including about 600 white collar workers.

Fluorspar.—U.S.S.R.'s domestic fluorspar output remained inadequate to meet demand despite the large reserves. Primorskiy Kray (Voznesensk deposit), Chita Oblast' (Kalanguev, Abagaytuysk, Solnechnoye, and Usuglinsk deposits), and Buryat A.S.S.R. were the main production areas in 1967. Another major producing center was Central Asia (Kulikolonsk, Takob, Naugarazan, Kandara, Chibargata, Chashly, Suppatash, and other deposits). Recently, new deposits have been discovered in the Ukraine (Pokrovo, Kireyevsk, and Pobuzhsk) and in Kazakhstan (Taskaynar, Myn-Aral, and others).

The Yaroslavskiy mining and concentrating combine, one of the Soviet's largest fluorspar concentrate producers recovered fluorspar from Voznesensk deposit. Con-

[12] Narodnove khozyaystvo Kazakhstana (National Economy of Kazakhstan). Alma-Ata, No. 6, 1967, p. 51.

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centrate output graded 93.5 percent CaF_2, and production costs were much less than the planned 80 rubles per ton of concentrate. It is planned to increase fluorspar output at this combine by 50 percent in 1970 over 1965.

The Transbaykal fluorspar trust (Soyuzplavik) in Chita Oblast' produced about 12,000 tons of fluorspar concentrate in 1967 from deposits mentioned above. The Solnechnyy mine's 1967 annual capacity was 30,000 tons of crude ore, and it is planned to increase this to 50,000 tons by 1970. The newly developed Brikatyanskaya mines of Transbaykal Trust are to process 35,000 tons of crude ore and extract 10,600 tons of concentrate in 1968.

Mica.—Seventy-five percent of all muscovite mica consumed in the country was produced in Mamsko-Chuyskiy Rayon (County) of Irkutsk Oblast'. Over 1,500 veins have been discovered in this area, and there were nine mines in operation in 1967. The Irkutsk mica factory was the largest in the U.S.S.R. Mica was also mined in Yakutsk A.S.S.R., Karelo-Murmanskiy region, and elsewhere. Strategic-grade mica continued to be imported from India to meet special industrial demands.

Refractories.—As in prior years, refractory production paced rising industrial output, but product quality was poor. The Shorzha refractory combine was under construction on the shore of the Sevan Lake and at the site of reserves of magnesium silicate rocks in Armenia. The first stage of the combine is to be commissioned by 1970.

Sulfur.—The U.S.S.R. is one of the leading countries in sulfur reserves, but sulfur content of ore is low and production costs high. The principal commercial deposits are Rozdol (West Ukraine), Gaurdak, Shorsu, and others (Central Asia), and Alekseyevsk, Vodninsk, and others (Volga group).

The Rozdol Mining and Chemical Combine in L'vov Oblast' was the country's major producer of native sulfur. There were two open pits in operation and two more under development. A second large native sulfur production facilities, the Yavorov Chemical-Mining Combine was under construction in the Ukraine, the first section of which is to be operational by 1970.

An open pit and a plant operated at the Gaurdak deposit in Turkmenia in 1967. Gaurdak was one of four exploited deposits of native sulfur in the Central Asia area. These deposits, together with the Rozdol Combine in the Ukraine, provided the bulk of the country's requirements.

The Kuybyshev Sulphur Combine, which also produces native sulfur, was commissioned in 1965. Several deposits (Alekseyevsk, Vodninsk, and others) have been developed in Kuybyshev Obast'. The combine accounted for only 10 to 12 percent of the Soviet native sulfur output in 1967.

Around 30 percent of Soviet sulfur was produced as byproduct or coproduct from pyrite, pyritic concentrates, petroleum refinery and coke oven gases, and natural gases.

Reportedly, the preliminary survey of the Tlumashskoye native sulfur deposit (not far from the Rozdol operation in the Ukraine) has been completed. The known reserves are large. It is planned to mine this deposit by the Frasch process, which previously has not been used in the U.S.S.R.

During 1966–67 a deposit of sulfur was discovered on the Kurila Islands.

Talc.—In 1967, only the Onotsk deposit in Irkutsk Oblast' produced high-grade talc. The raw material is shipped to the Miass talc mill in the Urals. The annual capacity of the Onotsk mine was 40,000 tons of talc. The country continued to import substantial quantities of high-grade talc.

The Kirgiteysk deposit in Krasnoyarsk Kray was the major producer of lower quality talc. The Miass and Shabrovsk deposits in the Urals ranked second in tonnage talc output. Some talc was mined from Southern Osetinsk and other small deposits. At the Miass talc combine a new crushing factory to process 200,000 tons of talc ore per year was under construction in 1967. Recently, the Alguysk deposit of powder quality talc was discovered in Kemorovo Oblast'.

MINERAL FUELS

In the Soviet Union production of primary energy from mineral fuels, fuelwood, hydroelectric, and nuclear sources rose from 489.2 million tons of standard

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fuel equivalent in 1955 to 1,128 million tons in 1967.

The most outstanding developments in 1955-67 period included the increase of oil production from 101.2 million to 412 million tons of standard fuel equivalent and that of natural gas from 11.4 million to 187 million tons of standard fuel. The share of these fuels in the Soviet primary energy supply rose correspondingly from 23.0 percent 53.0 percent. At the same time, the share of coal (lignite, bituminous, and anthracite) declined steadily from 63.7 percent in 1955 to 37.8 percent in 1967 of the total primary energy supply. Production of peat and oil shale has declined from 5.0 percent to 2.9 percent of all energy, but shale showed a significant absolute increase in output. While the trend is toward increasing production of crude oil and natural gas, and a decline in the share of coal in total energy output, coal was still the major source of energy consumed in the Soviet Union and will remain so for a number of years.

In spite of the expansion of the primary energy industry during recent years, output has not kept up with the demands of the Soviet economy, particularly in the European part of the U.S.S.R. According to

Table 6.—U.S.S.R: Total primary energy balance

(Million tons of standard fuel equivalent) [1]

Year	Total primary energy	Coal (lignite, anthracite, and bituminous) and coke	Crude oil and petroleum products	Natural and associated gas	Peat	Oil shale	Fuelwood	Hydroelectric power	Nuclear power
1955:									
Production	489.2	310.8	101.2	11.4	20.8	3.3	32.4	9.3	-----
Imports	16.0	9.3	6.7	-------	------	------	------	-------	-----
Exports	18.9	6.6	12.1	.2	------	------	------	(2)	-----
Apparent consumption	486.3	313.5	95.8	11.2	20.8	3.3	32.4	9.3	-----
1960:									
Production	713.2	373.1	211.4	54.4	20.4	4.8	28.7	20.4	-----
Imports	12.3	5.6	6.7	-------	------	------	------	-------	-----
Exports	65.6	16.0	49.3	.3	------	------	------	-------	-----
Apparent consumption	659.9	362.7	168.8	54.1	20.4	4.8	28.7	20.4	-----
1965:									
Production	1,002.6	415.9	347.3	151.3	17.0	7.5	30.0	32.6	1.0
Imports	10.6	7.6	3.0	-------	------	------	------	-------	-----
Exports	123.4	27.7	94.6	.5	------	------	------	.6	-----
Apparent consumption	889.8	395.8	255.7	150.8	17.0	7.5	30.0	32.0	1.0
1967:									
Production	1,128.5	424.0	412.0	187.0	25.0	8.0	31.0	40.0	1.5
Imports	10.9	8.7	2.2	-------	------	------	------	-------	-----
Exports	143.5	27.3	113.2	2.0	------	------	------	1.0	-----
Apparent consumption	995.9	405.4	301.0	185.0	25.0	8.0	31.0	39.0	1.5
1980:									
Production	2,332.0	585.0	857.0	650.0	50.0	15.0	31.0	140.0	4.0
Imports	43.0	10.0	15.0	18.0	------	------	------	-------	-----
Exports	315.0	40.0	250.0	21.0	------	------	------	4.0	-----
Apparent consumption	2,060.0	555.0	622.0	647.0	50.0	15.0	31.0	136.0	4.0

[1] 1 metric ton of standard fuel equivalent has a clorific value of 7 million kilocalories (7,000 kilocalories per kilogram) or the equivalent of 27,780,000 Britiah thermal units (13,100 Btu per pound).
[2] Negligible.

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Soviet sources, at present the fuel deficit in the European part of the U.S.S.R. reaches tens of millions of tons of standard fuel equivalent per year, and will grow to 80 to 100 million tons by 1970, and to 140 to 150 million tons of standard fuel by 1975. This deficit cannot be avoided because of a continuous growth in energy consumption in this area concomitant with industrial development, growing fuel export, and insufficient production in the Donetz basin.

By 1980, Soviet mineral-fuels production is to rise to 2,160 million tons of standard fuel, and total primary energy to 2,330 million tons. Compared with 1967 output, gas is to rise by about 240 percent, coal by 38 percent, oil by over 100 percent, hydroelectric power by 250 percent, and nuclear power by 170 percent.

As shown in table 6, total consumption of all types of primary energy in the U.S.S.R. is to be equivalent to over 2,000 million tons of standard fuel in 1980, about 1.7 times the 1970 consumption and double that of 1967.

Coal.—The Soviet Union produced 595 million tons of run-of-mine coal (444 million tons of hard coal and 151 million tons of brown coal and lignite), in 1967. The 1.5 percent increase from the 1966 level was achieved mainly in coking coal, 148 million tons of which was produced, 3.4 percent more than in 1966.

It is planned to produce 603.6 million tons of coal in 1968 and 635 million tons in 1970.

Average ash content of all marketable coal increased from 19.4 percent in 1966 to 19.6 percent in 1967; that of coking coal alone rose from 13.6 percent to 13.9 percent in 1967. During 1958 to 1967 the calorific value of coal shipped to Soviet consumers declined by over 10 percent, from an average of 5,560 kilocalories per kilogram in 1958 to about 5,000 kilocalories in 1967. The throughput of 160 coal preparation plants in 1967 was about 250 million tons, or only 42 percent of the total coal output. Preparation plants of the Ministry of the Coal Industry processed 195.7 million tons of run-of-mine coal yielding 112 million tons of clean coal in 1967. According to this ratio, Soviet production of 595 million tons of run-of-mine coal would yield 340 million tons of clean coal.

The share of coal mined open pit in the total output was 25.5 percent, compared with 24.9 percent in 1966 and 24.3 percent in 1965. Hydraulic coal mining accounted for 5.6 million tons (1.5 million ton increase), or 1.3 percent of the total underground output.

In 1967 there were 946 underground coal mines with an average annual capacity of 472,000 tons and 70 open pits with average annual output of about 2.1 million tons of run-of-mine coal in operation. The coal industry employed 2,182,000 men and women, including over 1 million "production workers," 54,000 professional engineers, and 125,000 technicians. On the average there were 53 specialists (mainly mining engineers and geologists) with university degrees and 124 technicians to a mine. The coal industry had 36 research and design establishments with a staff of 41,000 persons.

The maximum depth of coal mines reached 1,000 meters in 1967, while the average depth was about 333 meters. Average depths by basin were 398 meters in the Donets, 215 meters in the Kuznetsk, over 300 meters in the Karaganda, 57 meters in the Moscow, and about 420 meters in the Pechora. The relative importance of various methods in total output follows:

Method	*Percent*
Longwall	85.0
Inclined top slicing	8.0
Shield support	3.2
Room and pillar	1.7
Others	2.1

In 1967, 15.6 percent of the mines did not meet the production quota, resulting in the loss of 48.6 million rubles above losses planned for; 289 underground mines and 12 open pits were working below rated capacity. Soviet coal technology is nearly a decade behind Western standards, and productivity is low.

The average production cost of 1 ton of run-of-mine coal in 1966, was 8.69 rubles.

New Capacities.—Of the 20 underground mines and nine open pits planned with a total annual capacity of 21.7 million tons, 18 mines and nine open pits, with a total capacity of 19 million tons of run-of-mine coal were put into operation in 1967. Capital investment for 1967

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was 1,389 million rubles, or 56.4 million rubles over 1966.

The 1968 plan foresees commissioning of 23 mines and open pits with a total annual capacity of 19 million tons of raw coal and eight preparation plants with a total capacity of 26 million tons of run-of-mine coal per year.

Production Centers.—Raw coal production by principal basins in 1967 was as follows:

Basin	Million tons	
	Total ouput	Coking coal
Donets	209.1	80.6
Kuznetsk	102.4	41.0
Karaganda	33.4	14.3
Pechora	20.0	4.2
Others	230.1	7.9
Total	595.0	148.0

The Ukraine, with the Donets and L'vov-Volyn coal basins as the main centers, accounted for 43 percent of total underground output and for 55 percent of coking coal. There were 909,000 miners in the Ukraine's coal industry in 1967 and about 80,000 professional engineers and technicians. The turnover of personnel in the coal industry of the Ukraine reached 25 to 30 percent per year. This was caused mainly by the lag of housing, public cultural, and medical service development, low material incentives, and heavy and unsafety manual work conditions.[13]

The Donets basin took first place in the coal industry of the Soviet Union. There were 558 mines (271 vertical and 287 inclined) in this basin, with an average annual output of 375,000 tons of run-of-mine coal. The number of mines that did not fulfill their quotas increased from 24 in 1964 to 47 in 1967; 164 mines (or 34.9 percent of the total in the Ukrainian part of the Donets basin) did not attain designed capacities.

The Kuznetsk basin (Kuzbass) in Siberia was the second major producer of coal and one of the largest centers of fuel supply for Siberia, the Urals, Central Asia, and to some extent for the Center and Volga regions of the European U.S.S.R. It accounted for 23 percent of total hard coal and for 28 percent of total coking coal output. There were 94 underground mines in the Kuzbass with an average annual output of 850,000 tons of raw coal, and 15 open pits with an average output of 1.5 million tons of raw coal in 1967. In 1966, 27 mines failed to fulfill production targets, 20 mines fell short of productivity increase goals, and 48 mines did not attain additional output targets. Owing to underutilization of capacities of mine and coal preparation plants in the Kuzbass, the return on capital declined 19.3 percent during 1960–66.[14]

In Kazakhstan, the third largest producing region, over 100,000 "production workers" of the Karaganda basin produced 33.4 million tons of raw coal in 1967 from some 40 mines. The Ekibastus hard coal deposit produced about 15.5 million tons in open pits. Close to Ekibastus, the Maykuben brown coal deposits, with reserves of 9,000 million tons, have been explored. A significant portion of reserves may be worked by open-cast methods.

The Pechora basin in the European part of the U.S.S.R., with a production of 20 million tons, of raw coal ranked fourth in output in 1967 in terms of calorific value. Total reserves are estimated at 100,000 million tons. The average mine depth of working in the Vorkuta mines of this basin reached 417 meters.

The Moscow basin, which produces annually about 40 million tons of lignite with ash content of about 45 percent, was the fifth major coal producer in the U.S.S.R. in terms of calorific value. Total geological reserves of the Moscow lignite basin are estimated at about 10,000 million tons.

The Donets, Kuznetsk, Karaganda, and Pechora coal basins produced over four-fifths of the total coal output in calorific value and about 97 percent of the coking coal in the U.S.S.R.

Coal Preparation.—Preparation of coal for the market was normally restricted to coking coals and fuel for export. Because of shortage of coal, efforts were dircted solely to fulfilling quantitative goals, and little attention was paid to the quality.[15] About 65 percent of the coal beneficated

[13] Sovetskiy shakhter (Soviet Miner). Moscow, No. 5, 1968, p. 24.

[14] Ugol' (Coal). Moscow, No. 1, 1968, pp. 22–23.

[15] Ekonomicheskaya gazeta (Economic Gazette). Moscow, No. 13, March 1968, pp. 38–39.

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was washed, 20 percent was treated by pneumatic methods, and 15 percent was treated by heavy media, flotation, and other methods. Ten to fifteen percent of total coking coal shipped to consumers in 1967 was defective. Only 40 percent of the goal of the 1959-65 7-year plan in coal preparation plant construction was fulfilled. As a result, average ash content of marketable coal increased up to 19.6 percent in 1967.[16] Moreover, many new preparation plants were put into operation in spite of numerous imperfections and insufficient equipment. Labor productivity and use of capacity were below planned levels and a large number of personnel was occupied in repair and auxiliary operations. For example, the largest Soviet coal preparation plant—Gukovskaya Ts.O.F. in the Rostov Oblast', which was commissioned in 1963, attained only 50 percent of its planned capacity in 1967. In 1967, 160 operating Soviet preparation plants with a total capacity of about 300 million tons of raw coal per year employed over 50,000 workers.

Coal consumption.—During 1955–67 some shifts in the consumption sectors have taken place. As shown in table 7, thermal electric power stations were the largest single consumer of coal in the Soviet Union, with their share at total consumption rising from 20.2 percent in 1955 to 43.4 percent in 1967. As a result of dieselization and electrification of the railroad, transportations share of total coal consumption declined from 24.2 percent in 1955 to 5.6 percent in 1967. Coking coal demand rose from 16.3 percent in 1965 to 19.8 percent in 1967.

Table 7.—U.S.S.R.: Coal consumption

(Million metric tons)

	1955	1964	1967 •	1970 •	1975 •
Consumption:					
Electric power utilities	74.5	181.0	230.0	285.0	340.0
Transportation (rail and water)	89.3	42.0	30.0	17.0	13.0
Coke manufacture	60.1	94.5	105.0	120.0	130.0
General industrial uses and losses	125.8	140.7	125.0	112.0	100.0
Retail deliveries	3.2	14.7	19.0	23.0	26.0
Used in mine	15.6	20.5	22.0	23.0	26.0
Total	368.5	493.4	531.0	580.0	635.0
Production	391.3	554.0	595.0	635.0	700.0

• Estimate.

Gas.—*Production.*—In 1967, the country produced 158.6 billion cubic meters of usable gas, 11 percent more than in 1966, but below the target of 160 billion cubic meters. Of total output, 86.5 percent was nonassociated natural gas, 12.3 percent was associated gas, and 1.2 percent was from coal and oil shale gasification. In 1967, gas accounted for 17.6 percent of Soviet fuel production. Over 80 percent of the total was produced in the European part of the U.S.S.R., including about one-third in the Ukraine.

Of the nonassociated gas, about three-quarters was provided by four regions: Eastern Ukraine, Stavropol' Kray, Krasnodar Kray, and Uzbek S.S.R. Although natural gas production increased from 28.1 billion cubic meters in 1958 to 158.6 billion in 1967, the industry has not met its quota since 1956. Failure to meet goals has been attributed chiefly to inadequacies in pipeline transmission capacity and continued lags in the installation of compressors on existing gas pipelines. Natural gas production is slated to rise to 173 billion cubic meters in 1968, and 215 billion in 1970; estimated levels for 1975 and 1980 are 350 billion and 550 billion, respectively. Output by region for 1965-67 and projected output for 1970 appears in the following table:

[16] Ugol' (Coal). Moscow, No. 1, 1967, pp. 6–7.

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Region	Billion cubic meters			
	1965	1966	1967	1970
North Caucasus	38.4	41.5	42.5	45
Volga-Urals	21.2	23.2	24.0	25
Siberia (West and East)	-----	(1)	6.0	17
Ukraine	39.4	43.6	48.0	60
Uzbekistan	16.5	22.6	26.5	31
Turkmenistan	1.9	1.3	.9	10
Kazakhstan	(1)	(1)	(1)	5
Azerbaydzhan	6.2	6.2	6.3	7
Others	5.7	6.3	4.4	15
Total	129.3	144.7	158.6	215

[1] Insignificant.

In 1967, there were 297,000 employees in the Soviet gas industry, 5.5 workers per exploitation well. Many women were employed in pipeline construction.

The production cost of nonassociated gas per 1,000 cubic meters ranged from 0.14 ruble in Stavropol' Kray to 2.61 rubles in the Komi A.S.S.R. The national average was 0.45 ruble. The average wholesale price to industry for natural gas increased on July 1, 1967, from 12.3 rubles to 18.8 rubles per 1,000 cubic meters, or by 54 percent. The wholesale price ranged from 11 rubles to 24 rubles per 1,000 cubic meters depending upon area.

Reserves.—At yearend 1967, according to Soviet estimates, natural gas reserves in categories A+B+C1 reached 7,753 billion cubic meters. A total of 548 gas, gas condensate, and oil-gas deposits are known, including 14 with reserves above 100 billion cubic meters, and 32 with reserves from 30 to 100 billion cubic meters each. Twenty-four percent of explored reserves were in Western Siberia, 29 percent in Eastern Siberia, and 16 percent in Central Asia, including Mangyshlak. Thus, 70 percent of explored reserves were in the eastern regions of the U.S.S.R. There were over 200 proven fields of natural gas (including 133 fields of nonassociated gas) in the Soviet Union; 2,683 wells were operational at nonassociated gas deposits at the beginning of 1967, of which 15 to 20 percent were idle. The average depth of wells at nonassociated gas deposits was 1,200 meters. In 1967, 11 gas deposits were put into operation and 26 new deposits were discovered in northern Tyumen Oblast', Komi A.S.S.R., Uzbekistan, Turkmenistan, Kazakhstan, and other regions.

Of targeted gas wells, only 78 percent were put into operation and only 63 percent of targeted liquefied gas plant capacity was completed.

Transportation.—Because the principal gas-consuming centers are far from the gasfields, the bulk of natural gas output must be transported by large pipelines. Over 80 percent of 1967 natural gas production was carried by trunk pipelines, and only 20 percent was consumed at or near the place of production. The total length of gas trunk pipelines was 52,300 kilometers at yearend 1967; 4,940 kilometers of gas trunk pipelines were completed during the year. By yearend 1970, the total is to be increased to about 67,500 kilometers. The average distance of gas transport in trunk gas pipelines was 743 kilometers in 1967, compared with 570 kilometers in 1959 and a planned 850 kilometers in 1980.

Construction of the Central Asia Center gas pipeline No. 1, 1,020 millimeters in diameter and 2,750 kilometers long, was completed on October 5, 1967. In 1968, it is to deliver 16 million cubic meters daily. About 10,000 workers were involved in construction of this line. The 1,020-millimeter, 553-kilometer Ostrogozhsk-Belousovo line was also completed.

The major pipelines to be completed in 1966–70 are the Central Asia Center pipeline, and a pipeline from West Siberia to the European part of the U.S.S.R. Each has a capacity of 22 to 26 billion cubic meters per year.

Work was initiated on the construction of a system of transmission gas pipelines from the North of Tyumen' Oblast' to regions of the Center, West, and Urals. The length of this system will be 7,430 kilometers. Of this, the Northern branch

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will account for 5,394 kilometers (Nadym-Salekhard-Ukhta-Kotlas-Cherepovets-Torzhok-Minsk) including the two pipes to be built from Cherepovets to Leningrad and Gorkiy; The Urals branch will account for the remaining 2,036 kilometers (Nadym-Serginy-Komsomol'skiy and Idvel-Nizhnyaya Tura-Sverdlovsk-Chelya-binsk) including the pipelines to be built from Nizhnyaya Tura to Perm, Berezneki, and Izhevsk. A drafe plan was being prepared for the Kotlas-Archangel-Severodvinsk gas pipeline.

Consumption.—Reported, planned, and estimated consumption of natural gas in the U.S.S.R. is presented in table 7.

About 60 percent of the natural gas extracted is utilized for industrial purposes. Natural gas became of considerable significannce in ferrous metallurgy, whose share in the total Soviet gas consumption in 1967 rose to 17.8 percent compared with 7.5 percent in 1959.

Trade.—For some years the U.S.S.R. has been exporting minor quantities of natural gas to Poland by a pipeline from

Table 8.—U.S.S.R: Natural gas supply and disposal

(Billion cubic meters)

	Actual			Planned	
	1959	1965	1966	1967	1970
Production	37.3	129.3	144.7	160.0	215.0
Imports	-----	-----	-----	-----	5.0
Exports	0.2	0.4	0.8	1.4	3.0
Total gas for distribution	37.1	128.9	143.9	158.6	217.0
Consumption:					
Domestic use	4.6	14.9	16.0	17.0	22.0
Industry:					
Metallurgy	2.8	18.4	22.6	28.2	40.0
Chemical	1.0	6.1	6.3	7.6	13.0
Machine-building and metal-working	2.9	12.8	15.2	17.6	19.0
Construction materials	3.7	14.0	14.5	15.0	18.0
Other	10.2	23.6	22.0	26.3	36.0
Total	20.6	74.9	80.6	94.7	126.0
Electric power stations	11.0	35.7	41.6	41.0	56.0
Gas industry use and loses	0.9	2.8	4.4	4.3	8.8
Transport	-----	0.4	0.8	1.0	1.2
Agriculture	-----	0.2	0.5	0.6	3.0

the Dashava fields of the Ukraine. In 1967, work was completed on the 820/720-millimeter 540-kilometer Friendship gas pipeline from Dashava to Bratislava, Czechoslovakia. In 1968 the U.S.S.R. is to supply Czechoslovakia with 500 million cubic meters of gas from deposits in the Ukraine and a minimum 1 billion cubic meters per year by 1970. Annual Soviet gas deliveries to Poland are to increase from 0.8 billion cubic meters in 1965 to about 3 billion cubic meters during 1970–85.

The Soviet Union recently signed a contract with Finland for construction of a pipeline from Leningrad to Helsinki. Trade agreements with France and Japan foresee Soviet deliveries of natural gas in liquefied form. The Soviets were known to have offered Japan annual deliveries of 2 billion cubic meters from Sakhalin, over a period of 15 years. In 1967, the Soviets asked the Japanese business leaders for cooperation in the development of natural gas in the Siberian area and in the building of a pipeline from the Tyumen' area to the Pacific. The first stage of talks about the supply of Soviet natural gas to Sweden ended in Moscow in 1967. The possibility of transporting the gas by pipeline or in special ships was considered.

The U.S.S.R. offered natural gas to Austria, Italy, Japan, and other developed countries in exchange for steel pipe and other equipment which will help in the development of the Soviet gas industry.

Austria will receive some 200 to 500 million cubic meters of Soviet gas annually in 1968–70, through an extension of the newly completed Friendship gas pipeline.

Afghanistan started natural gas deliveries to the Soviet Union in 1967 through the recently completed Afghanistan-

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U.S.S.R. pipeline. The pipeline was designed to deliver annually 2 billion cubic meters. An agreement signed in May 1967 by the U.S.S.R. and Afghanistan envisages delivery of 57.7 billion cubic meters of gas to the Soviet Union during 1967–85.

In January 1966, the U.S.S.R. and Iran signed an agreement to build a gas pipeline from Iran to the U.S.S.R. The Soviet Union will construct the northern half of the pipeline, from Kuh Namak to Astara, and also build a 1,020-millimeter, 172-kilometer spur from Kuh Namak to Tehran. This pipeline, which will have a 1,220-millimeter diameter (the largest in the U.S.S.R.), must be completed in 1969 when it is proposed to deliver to the Soviet republics of Transcaucasus the first 2 billion cubic meters of gas, rising to 10 billion in 1970–72. Iranian gas will flow through the new pipeline into the Soviet pipeline network and reach Moscow. Storage for natural gas is under construction in Azerbaydzhan.

By 1970, the Soviet Union should be importing from Iran and Afghanistan as much as 5 billion cubic meters. Information in the Soviet press indicates a desire of planners to import from both countries some 13 billion cubic meters in 1975 and 15 billion in 1980.

Petroleum.—The U.S.S.R. was the second largest oil-producing country in the world. Crude oil output increased 9 percent over that of 1966 and totaled 288.3 million tons. Over one-fourth of the total was exported, either as crude or as refinery products. In 1967, the return from these exports was 1,037 million rubles, 79 million rubles more than in 1966.

Oil was produced in a number of widely separated regions, of which the European U.S.S.R. was the most important. Production from the Asiatic oilfields in Tyumen Oblast' (West Siberia), Mangyshak (Kazakhstan), Central Asia, and Sakhalin Island remained small. The largest increase in the production of crude oil occurred in Tataria, Bashkiria, and Kuybyshev Oblast'. The Volga-Ural area produced more than two-thirds of the 1967 total. There were 2.6 million employees in the oil, gas, petrochemical, and chemical industries in 1967.

Crude oil reserves (measured plus indicated) increased by a total of about 360 million tons in 1967, compared with a planned goal 380 million tons. As of January 1, 1968, the geological reserves of crude oil in the U.S.S.R. may total 31,000 million tons,[17] including 3,600 million tons measured, 5,400 million tons indicated, and 22,000 million tons inferred. A 30- to 40-percent recovery of crude oil in place was claimed in 1967.

There were 390 oil and oil gas deposits being exploited in 1967. There were about 52,500 wells on January 1, 1967, including around 5,000 inactive wells. The average depth of development wells increased from 1,653 meters in 1966 to 1,682 meters in 1967 and that of exploratory wells from 2,269 to 2,289 meters. The cost of 1 meter of development drilling was 60.97 rubles; that of 1 meter of exploration drilling was 163.82 rubles. In 1967, about 80 percent of the total footage was drilled by turbodrills. Soviet practice showed that rotary drilling at depths greater than 1,500 meters was more efficient than turbodrilling. The maximum depth of drilling in the U.S.S.R. was 6,114 meters on November 16, 1967. Planned 1967 drilling targets were 6.2 million meters of development, or 9.4 percent more than that drilled in 1966, and 3.5 million meters of exploratory drilling, an increase of 6.4 percent. A total of 2,936 wells was to be placed in production in 1967. The 1967 plan for development drilling was fulfilled by 93 percent and for exploratory drilling by 96 percent. In 1967, an investment of 1,525 million rubles was planned for production facilities and some 1,250 million rubles for oil and gas deposits exploration. In 1967, 41 oil deposits, 13 gas deposits, and five oil and gas deposits were discovered.

In 1967, petroleum product consumption in the U.S.S.R. is estimated to have risen to 182 million tons (including an estimated 3.5 million tons of synthetic products and liquefied petroleum gases), or 7 percent above that of 1966.

In 1967, refinery throughput increased by 14 million tons (6.6 percent), whereas the planned increase was 20 million tons (9.4 percent). Additional capacity was commissioned during the year at the Omsk, Ryazan', Novoyaroslavl', Novo-Baku, and Polotsk oil refineries. Capital investment

[17] Bureau of Mines estimate.

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in a 6-million-ton refinery was 40 to 45 million rubles. Refinery consumption and losses were 13.4 percent of throughput. Total capacity of refineries at yearend was estimated at 254 million tons. The total estimated output of nongaseous products in 1967 reached 202 million tons.

On January 1, 1967, trunk crude and product pipelines totaled 27,867 kilometers, and the average diameter was 560 millimeters. The largest pipe made in the U.S.S.R. was 1,220 millimeters. Deliveries by pipeline totaled only 60 to 80 percent of rated capacities.

In 1967, over 70 percent of all oil wells in the U.S.S.R. were equipped with deep rod pumps, but these produced only 19 percent of total national output. Artificial flooding was used in all oil-producing regions; 59 percent of total output was from naturally flowing wells, but these constituted only 17.3 percent of the total number of wells.

Beginning July 1, 1967, a single price for crude oil was established for each refinery, regardless of the source and quality of the crude.

Table 9.—U.S.S.R.: Salient petroleum statistics

(Million metric tons)

Item	Actual			Planned and estimated			
	1965	1966	1967	1968	1970	1975	1980
Crude oil:							
Domestic output	242.9	265.1	288.3	309	350	465	600
Imports	----	----	----	----	----	5	10
Exports	43.4	50.3	54.1	60	73	100	125
Crude product conversion:							
Crude oil to refineries	199.5	214.8	234.2	249	277	370	485
Refinery capacity	225.0	238.0	254.0	270	300	400	525
Refined oil:							
Output from crude	173.0	188.0	202.0	216	240	320	420
Natural gas liquids	2.8	3.0	3.5	4	5	8	12
Imports	1.9	1.7	1.4	1	1	(1)	(1)
Exports	21.0	23.3	24.7	26	30	42	55
Apparent consumption	156.7	169.4	182.2	195	216	286	377

[1] Insignificant.

Oilfields and Crude Oil Production.—In 1967, the Volga-Ural area contributed about 70 percent of national output; this area will continue to lead until the developing oilfields of Siberia, Mangyshlak, and the Ukraine come into their own. In 1970 crude output in the Volga-Ural area is to reach 215 million tons, or more than 60 percent of the national total.

Soviet calculations indicate that in 1980 crude oil output should reach 600 million tons for an average annual increase of 22 to 23 million tons during 1971–75, and of not less than 27 million tons during 1975–80. Under these projections, Volga-Ural is to produce some 240 million tons, or 40 percent of the entire output by 1980 and output of Western Siberia and Western Kazakhstan should rise to 200 to 220 million tons, or 33 percent of the nation's output. The Ukraine and Belorussia in 1980 are to produce around 42 million tons, the Northern Caucasus about 35 million tons, and Azerbaydzhan 22 to 25 million tons. Central Asia, and Western Turkmenia are to increase output to approximately 29 million tons by 1980.

Regional production of crude oil in the U.S.S.R. is given in table 10.

Refining.—In 1967, refining capacity was increased by 6.6 percent compared with 1966. In both 1966 and 1967 refinery construction fell below target by about 20 percent.

In 1967, new installations for catalytic cracking were under construction at the Ryazan', Omsk, Kremenchug (Second Stage) and Krasnovodsk petroleum refineries. Construction began of a new oil refinery near Ashkhabad (Turkmenistan). It is planned to start construction of the Lisichansk refinery in the Lugansk area of the Donets basin and at Mozyr in Belorussia. There were plans for the expansion of the Angarsk oil refinery. The U.S.S.R. State Planning Committee (Gos-

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Table 10.—U.S.S.R.: Crude oil production, by regions

(Million metric tons)

Region	Actual			Planned	
	1965	1966	1967	1968	1970
Volga-Ural:					
Tatar A.S.S.R.	76.5	83.2	89.1	93.3	98.0
Bashnir A.S.S.R.	43.9	46.3	47.8	48.5	49.0
Kuybyshev Oblast'	33.4	33.7	34.2	34.8	36.0
Perm Oblast'	9.7	11.5	13.0	14.5	17.0
Lower Volga	6.2	NA	NA	NA	9.0
Orenburg Oblast'	2.6	3.4	NA	NA	4.0
Saratov Oblast'	1.3	NA	NA	NA	2.0
Total	173.6	186.0	196.5	204.0	215.0
Azerbaydzhan S.S.R.	21.5	21.7	21.6	21.4	22.0
Turkmen S.S.R.	9.6	10.7	11.8	12.8	14.0
Checheno-Ingush A.A.S.R.	9.0	11.2	13.6	15.8	17.5
Ukrainian S.S.R.	7.6	9.0	10.6	11.6	14.5
Stavropol' Kray	4.6	5.1	5.6	NA	6.8
Dagestan	NA	NA	1.4	NA	1.6
Sakhalin Island	2.4	2.6	3.0	NA	3.5
Komi A.S.S.R.	2.2	NA	3.8	NA	6.0
Kazakh S.S.R.	2.0	3.1	5.7	7.5	15.0
Western Siberia	.9	2.8	5.8	10.0	25.0
Belorussian S.S.R.	(1)	.2	.8	1.7	4.0
Uzbek S.S.R.	1.8	NA	1.7	NA	3.0
Other [2]	7.7	12.7	6.4	24.2	2.1
Grand total	242.9	265.1	288.3	309.0	350.0

NA Not available.
[1] Insignificant.
[2] Includes "Not available" figures.

plan) approved the project to build an oil refinery near Port Nakhodka in the Soviet Far East during 1971–75.

Petroleum processing plants had serious difficulties in disposing of products, resulting in underutilization of capacity at a number of plants. Pipeline and other means of transportation lagged sharply behind production and constituted a bottleneck. An additional problem for the refineries was quality of the crude supplied (in terms of salt and water content).[18]

For many years Soviet technology in dehydration, desalting, and crude stabilization has lagged behind that of other countries. In 1967, only 69 percent of the country's oil output was pretreated in the fields, as follows: 44 percent was merely dehydrated, 10 percent was dehydrated and desalted, and 15 percent was dehydrated, desalted, and stabilized.

As a result of inadequate pretreatment, water content in crudes received by the refineries reached 0.5 to 2.0 percent, with 1,000 to 3,000 milligrams per liter of salts. Following the processing of oil at the refineries, water content dropped to 0.1 to 0.3 percent and salt content to 30 to 60 milligrams per liter. The unrecoverable losses at refineries were high, and waste heat was scarcely utilized.

Consumption of Petroleum Products.—The consumption of petroleum products in the U.S.S.R. is given in table 11. In 1967, the major portion was consumed by industry, with only about 2.5 percent used for domestic heating. The remainder was distributed fairly equally between agriculture, transportation, and military uses. Transportations share of total petroleum consumption is expected to grow from 16 percent in 1959 to 23 percent in 1980, with road and air transport the most significant consumers.

Table 11.—U.S.S.R.: Petroleum product consumption

(Million metric tons)

	Actual 1959	Planned and estimated		
		1965	1967	1970
Industry	43.7	72.1	83.4	98.0
Agriculture	19.4	29.8	33.0	38.0
Transport	15.5	28.2	33.8	42.0
Domestic	2.5	3.9	4.6	5.0
Military and other	16.0	22.7	27.4	33.0
Total	97.1	156.7	182.2	216.0

[18] Neftepererabotka i neftekhimiya (Petroleum Processing and Petroleum Chemistry). Moscow No. 1, 1968, pp. 1–4.

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Transportation.—Trunk pipeline mileage has been increased considerably in recent years and as of January, 1, 1967, totaled 27,867 kilometers, including 22,690 kilometers of crude oil lines and 5,177 kilometers of oil product lines. The average diameter of crude oil pipelines was 582 millimeters and the average distance of crude and product pipeline delivery in 1967 was about 700 kilometers, 500 kilometers for crude and about 850 kilometers for products.

Lags in pipeline development have hampered oilfield operation. Because of such a lag, crude oil production on the Mangyshlak Peninsula has been held back. Over a period of years, great difficulty in loading crude oil has been encountered in the Ukraine, Turkemenia, Groznyy, Stavropol', Tataria, and elsewhere. Only 60 to 80 percent of total pipeline capacity was utilized.

The 529-millimeter, 410-kilometer Shaim-Tyumen trunk crude oil pipeline (the first in Western Siberia), planned to transport crude oil from the Shaim deposit to the region of Tyumen, was completed in September at a cost of 50 million rubles. Almost 45,000 tons of pipe were used in construction of the line, which began in 1964. The second crude oil pipeline in Western Siberia, the 1,020-millimeter, 964-kilometer line from Ust-Balyk to Omsk was put into operation October 30, 1967, but will not be fully operational until 1968. Crude oil from deposits in Tyumen Oblast' may now be transported to the Omsk and other refineries of the country.

Construction of the branch of the Friendship crude oil pipeline from Polotsk to Ventspils in Latvia on the Baltic Sea, more than 500 kilometers in length, was completed in December.

During 1967, in the Soviet Far East, the second 615-kilometer crude oil pipeline from Okha-on-Sakhalin to Komsomol'sk-on-Amur in Khabarovsk Kray was under construction, and more than 300 kilometers was laid. Completion of this line was rescheduled for 1970; originally it was planned to put the entire line into operation by 1967.

Construction of Friendship crude oil pipeline No. 2 started in November 1967. This line will parallel the first and will extend over 5,000 kilometers from the Tataria to Czechoslovakia. Upon its completion, the annual capacity of the Friendship pipeline system will double. In Czechoslovakia the laying of the second line was already nearing completion.

Plans for heated, 2,500-kilometer pipeline to carry waxy crude oil from Mangyshlak Peninsula to refineries in the Volga area and the Ukraine (Gur'ev, Orsk, Volgograd, Kuybyshev, Kremenchug, and Lisichansk) were completed. Construction of the first section, between Uzen and Gur'ev, is scheduled for 1969.

Planned development of crude petroleum and product pipelines during 1966–70, according to Soviet data, is as follows:

Item		1965 (actual)	1970 (plan)
Length of pipelines at end of year	kilometers	27,217	39,818
Crude pipelines	do	22,217	31,615
Product pipelines	do	5,000	8,203
Movement by pipelines	million tons	225.9	346.3
Average length of haul	kilometers	650	815
Share of pipelines in movement of oil freight	percent	45.3	47.7
Share of pipelines in ton-kilometers of oil movement	do	30.6	40.4

Source: Transport i khranenie nefti i nefteproductov (Transport and Storage of Crude Oil and Petroleum Products). Moscow, No. 11, 1967, pp. 6–8.

Trade.—Soviet exports of crude oil and petroleum products totaled 78.8 million tons in 1967, a 7 percent increase over 1966. Of the 1967 total, 69 percent was crude oil, and 31 percent was products. Italy received over 30 percent more Soviet oil than in 1966, however, exports to Japan, India, and some other non-European countries dropped sharply. Sakhalin oil accounted for about one-third of Soviet oil exports to Japan.

In 1967, Soviet oil was pumped to Poland, East Germany, Czechoslovakia, and Hungary through the Friendship pipeline. Deliveries to other countries were by tanker and by rail.

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The 1970 export picture is reasonably clear. According to signed trade agreements between the U.S.S.R. and other East European Communist countries, expected levels in 1970 and 5-year totals for each country are:

Country	1966–70		1970 Crude
	Crude	Products	
Bulgaria	15.7	6.0	3.9
Czechoslovakia	40.0	------	9.6
Germany, East	36.0	------	9.0
Hungary	16.0	------	3.9
Poland	26.0	7.3	9.5
Yugoslavia	4.8	3.0	1.0
Total	138.5	16.3	36.9

Based on the latest Soviet forecasts, crude oil exports from the U.S.S.R. will show further significant growth by 1980, perhaps attaining 125 million tons per year. In 1980, the Soviet Union will probably be importing some 10 million tons of crude from other countries.

Although Soviet oil exports are increasing, the country's share of international oil trade during 1968–80 is expected to be a constant 4 to 5 percent.

The Soviets expressed readiness to supply an annual average of 10 to 15 million tons of petroleum to Japan as collateral over 20 years if Japan would furnish necessary pipeline facilities to the Soviet Union. A definite 1971–74 target date was set for building the 6,500-kilometer trans-Siberian pipeline aimed at crude oil export to Japan, while a Baltic line to the Latvian port of Ventspils, which was completed in 1967, will supply oil for Europe.

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The Mineral Industry of the United Arab Republic

By Walter C. Woodmansee [1]

During 1967 the most significant mineral industry developments in the United Arab Republic were in the petroleum sector. El Morgan oilfield in the Gulf of Suez went into production. Another major discovery, El Alamein in the Western Desert, was under development, and several other notable oil and gas discoveries were reported. A pronounced increase in crude oil output is anticipated.

The Arab-Israeli conflict in June caused a decline in economic activity in the U.A.R., including that of its mineral industry, during the remainder of 1967. Reliable statistical indicators were not available but several industrial sectors operated at only partial capacity. The mineral industry was affected by shortages of trained personnel and equipment, and development plans were delayed or reduced. Rather than a second 5-year plan, the Ministry of Planning announced, in February, a 3-year achievement plan, effective with the new fiscal year starting July 1, under which emphasis was to be placed on projects underway and maximum utilization of existing capacities rather than new development programs. About $810 million [2] per year was originally appropriated for total investment spending under the plan, but in July this appropriation was reduced to $570 million, including $110 million for industry, of which about $50 million was for the petroleum sector. The U.S.S.R. advanced credits totaling about $287 million for development projects, including $36 million for petroleum exploration and equipment.

In addition to petroleum, the fertilizer and iron and steel sectors also were given priority in development planning. Expansion at the Helwan steelworks, however, was delayed because of the need for a $35 million railroad from the Baharia Oasis iron ore mine to Helwan. Later in the year, additional funds totaling $21 million were set aside for the Helwan project.[3]

Development projects were planned or underway in the Aswan region, where abundant low-cost electric power was available from the Aswan High Dam. The Ministry of Industry sought private investment in iron and steel, ferroalloys, aluminum, and fertilizers. Poland agreed to investigate possibilities for an aluminum industry. France had provided a $30 million, long-term loan for iron and steel and fertilizer development. A United Nations project included a $3.6 million, 4- to 5-year photogeological survey and mineral exploration of a 95,000-square-kilometer tract in the Aswan region in conjunction with the U.A.R. Geological Survey.[4] Another United Nations project involved a mining and petroleum institute to be established at Suez within 4½ years at a cost of $2.5 million.

Data on the role of the mineral industry in the total economy are not available for 1967, but in 1966 it contributed about 10 percent of the gross national product, which was estimated at $5 billion. According to the Central Bureau for General Mobilization and Statistics, industrial production totaled nearly $2.8 billion in 1966, including the following sectors directly or indirectly related to the mineral industry:

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[1] Physical scientist, Division of International Activities.

[2] Where necessary, values have been converted from Egyptian pounds (£E) to U.S. dollars at the rate of £E1=US$2.30.

[3] The Economist Intelligence Unit. Quarterly Economic Review, United Arab Republic. No. 4, December 1967, p. 11.

[4] World Mining. V. 2, No. 13, December 1966, p. 31.

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Chemicals $347.3 million, petroleum $236.9 million, building materials $80.5 million, and metallurgical $27.6 million.

In the mineral-extractive sector, including both mining and quarrying, value of output in 1966 was about $27 million. Major products were phosphate rock $4.6 million, marble $3.5 million, salt $3.2 million, limestone $3 million, iron ore $2.5 million, and gypsum $2 million.

PRODUCTION

Except for cement, mineral and metal production statistics are not available for 1967. The degree of disruption of mining, metallurgical, and petroleum activities caused by the June war and its aftermath was not indicated.

Estimates are made for a few commodities.

Among the major commodities produced in 1966, cement, fertilizers, gypsum, limestone, phosphate rock, salt, and sulfur showed notable increases in output over 1965. Crude and refined petroleum output remained fairly static in 1966, but new oil and gas, iron and steel, and fertilizer developments indicated future growth in these sectors.

Table 1.—United Arab Republic: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Aluminum, semimanufactures	2,106	3,831	5,155	6,220	NA
Copper, unwrought and semimanufactures	6,513	8,019	7,057	6,941	NA
Iron and steel:					
Iron ore—thousand tons	r 489	447	r 507	r 440	e 500
Pig iron—do	205	192	r 190	215	e 215
Ingots—do	197	r 176	179	195	e 200
Semimanufactures—do	e 350	375	340	378	NA
Iron oxide, mainly for pigment	482	325	370	1,030	NA
Lead:					
Content of ore e	500	------	------	15	NA
Unwrought and semimanufactures	3,653	3,634	3,577	4,205	NA
Manganese ore:					
Over 35 percent Mn—thousand tons	6	43	24	24	NA
Under 35 percent Mn—do	42	285	158	162	NA
Total—do	48	328	182	186	NA
Titanium ore and concentrate, mainly ilmenite	541	21	------	r 2,308	NA
Zirconium concentrate	40	41	------	389	NA
Metallic ore and concentrate, n.e.s.	1,855	------	------	------	NA
Nonmetals:					
Asbestos	174	1,578	2,926	1,866	NA
Barite	4,123	4,551	15,353	6,799	NA
Cement, portland and other—thousand tons	2,509	2,521	2,422	2,556	2,736
Clay and clay products:					
Fire clay for ceramic use—thousand cubic meters	464	436	447	495	NA
Kaolinite	r 21,009	62,796	47,775	49,987	NA
Refractory clay	3,281	1 39,989	1 72,915	1 63,604	NA
Brick, tile, pipe, etc., for construction use e—thousand tons	2,900	3,200	3,500	3,500	NA
Brick, refractory—do	63	e 70	73	71	NA
Feldspar	------	4,728	e 4,000	3,499	NA
Fertilizer materials:					
Crude:					
Nitrogenous (sodium nitrate)	4,000	4,652	4,218	------	NA
Phosphate rock—thousand tons	r 612	613	594	661	e 610
Manufactured:					
Nitrogenous—do	620	783	714	750	NA
Phosphatic, including Thomas slag—thousand tons	189	244	287	308	NA
Gypsum, crude—do	454	337	r 229	459	e 250
Limestone—thousand cubic meters	3,185	2,692	3,051	3,376	NA
Mica and vermiculite	r 60	416	580	------	NA
Pumice—cubic meters	8,722	21,572	25,657	------	NA
Quarry stone, mainly for construction uses:					
Basalt—thousand cubic meters	187	411	r 662	380	NA
Granite—do	229	241	313	24	NA
Sand and gravel, including glass sand—thousand cubic meters	3,078	3,584	r 3,839	3,412	NA
Sandstone—do	155	157	221	------	NA
Other—do	284	289	307	55	NA

See footnotes at end of table.

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Table 1.—United Arab Republic: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals—Continued					
Salt—thousand tons	392	675	494	627	e 630
Sodium compounds, n.e.s.: Caustic soda	17,556	16,298	18,861	19,310	NA
Sulfur [2]	r 7,151	2,466	r 3,851	11,674	NA
Sulfuric acid—thousand tons	113	170	194	213	NA
Talc	r 4,790	16,821	39,628	29,638	NA
Mineral fuels:					
Coal—thousand tons	------	--------	r 67	e r 60	NA
Coke, oven and beehive—do	e 35	e 35	r 257	274	e 275
Coke, low temperature and gashouse—do	35	35	40	50	NA
Petroleum:					
Crude—thousand 42-gallon barrels	38,759	43,915	45,556	44,070	e [3] 42,000
Refinery products: r					
Gasoline—do	6,069	6,435	7,302	7,217	NA
Kerosine and jet fuel—do	6,557	7,719	6,882	7,339	NA
Distillate fuel oil—do	7,743	8,945	9,221	10,839	NA
Residual fuel oil—do	22,591	28,225	31,175	27,945	NA
Liquefied petroleum gas—do	456	597	690	842	NA
Asphalt and bitumen—do	897	915	812	812	NA
Petroleum coke—do	------	--------	369	1,155	NA
Total—do	44,313	52,836	56,451	56,149	NA

e Estimate. r Revised. NA. Not available.
[1] Apparently includes small quantities of diatomite.
[2] Derived from petroleum, except for 1963, when 4,750 tons was mined.
[3] Excludes production by Israel from United Arab Republic oilfields.

TRADE

Metal and mineral trade during 1966 was characterized by exports of cement, phosphate rock, and petroleum and by imports of crude oil, iron and steel, nitrogenous fertilizers, and nonferrous metals. According to the Central Agency for Mobilization and Statistics, principal mineral exports and their values were as follows:

Value of principal trade commodities

(Million dollars)

Commodity	1965	1966
	EXPORTS	
Petroleum refinery products:		
Fuel oil	$24.1	$21.1
Crude oil	15.3	14.0
Cement	4.5	5.2
Phosphate rock	3.5	3.7
	IMPORTS	
Iron and steel (mainly semimanufactures)	54.2	63.1
Crude oil	58.8	56.4
Fertilizers (mainly nitrogenous)	28.3	27.0
Petroleum refinery products (mainly lubricants)	8.2	15.5
Coal	7.2	7.1

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	50	605	8.3
1966	48	605	7.9
Imports:			
1965	186	934	19.9
1966	195	1,071	18.2
Trade balance:			
1965	−136	−329	XX
1966	−147	−466	XX

XX Not applicable.
[1] Includes only those commodities listed in tables 2 and 3 of this chapter.

Only meager data were available on countries with which the U.A.R. traded in mineral commodities during 1966, particularly regarding imports. Major sources of crude oil (in thousand barrels) were Saudi Arabia 14,771, U.S.S.R. 7,059, and Kuwait 4,280.

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Table 2.—United Arab Republic: Exports of major mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Iron and steel, semimanufactures	3,076	226	NA.
Manganese ore thousand tons	163	122	Italy 50; Japan 31; United Kingdom 17.
Nonmetals:			
Cement do	310	375	Saudi Arabia 159; Jordan 67; Yemen 32.
Clay, kaolin	3,846	NA	NA.
Fertilizer materials:			
Crude: Phosphate rock thousand tons	374	371	Poland 90; India 71; Czechoslovakia 57.
Manufactured:			
Nitrogenous	7,000	68,294	NA.
Phosphatic	24,311	38,067	Yugoslavia 12,698; Czechoslovakia 12,000; Italy 8,535.
Gypsum, calcined thousand tons	38	53	Japan 27; Singapore 11.
Salt do	230	274	Japan 212; United States 35.
Stone, crushed, for construction use	7,847	NA	NA.
Talc and steatite	1,185	1,255	East Germany 778; United Kingdom 300.
Mineral fuels:			
Petroleum:			
Crude thousand 42-gallon barrels	11,079	10,629	NA.
Refinery products: r			
Gasoline do	3,724	5,085	NA.
Kerosine do	138	350	NA.
Distillate fuel oil do	12,315	7,229	NA.
Residual fuel oil do	736	771	NA.
Liquefied petroleum gas do	4	9	NA.
Asphalt and bitumen do	50	87	NA.
Total do	16,967	13,531	

r Revised. NA. Not available.

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Table 3.—United Arab Republic: Imports of major mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity		1965	1966
Metals:			
Aluminum, all forms [2]		5,562	8,590
Copper, all forms [2]		3,402	4,399
Iron and steel:			
Scrap		30,245	141,703
Pig iron and ferroalloys		138,649	75,060
Semimanufactures		269,439	335,326
Lead, all forms [2]		4,621	4,575
Manganese		245	NA
Mercury	76-pound flasks	377	NA
Precious metals:			
Gold	troy ounces	649	NA
Platinum	do.	5,223	NA
Silver	thousand troy ounces	804	e 830
Tin, all forms [2]	long tons	509	491
Zinc, all forms [2]		1,527	3,526
Ores, metallic, n.e.s.		15,856	8
Oxides, metallic, mainly for paint		e 3,800	NA
Nonmetals:			
Abrasive materials		406	NA
Asbestos		4,606	6,817
Barite		800	NA
Carbon and carbon black		2,218	NA
Cement	thousand tons	289	180
Clay, mainly kaolin		10,113	7,915
Diatomite		2,207	1,403
Dolomite and magnesite		3,314	2,707
Feldspar		505	NA
Fertilizer materials:			
Nitrogenous	thousand tons	r 556	517
Phosphatic	do.	48	59
Graphite		5,951	NA
Pigments, mineral		845	NA
Refractory materials, brick		3,782	10,719
Soda, caustic		40,412	25,944
Stone for construction use:			
Marble		-------	311
Dimension stone, n.e.s.	thousand square meters	104	NA
Crushed		594	NA
Sulfur:			
Pyrite		45,464	93,348
Elemental		38,027	39,693
Talc		175	NA
Wax, mineral		2,189	NA
Compounds, nonmetallic, n.e.s.		20,693	NA
Mineral fuels:			
Coal	thousand tons	409	292
Coke	do.	33	5
Petroleum:			
Crude	thousand 42-gallon barrels	29,417	28,604
Refinery products: r			
Gasoline	do.	96	143
Kerosine	do.	278	1,099
Distillate fuel oil	do.	107	18
Residual fuel oil	do.	9	2
Lubricants	do.	320	602
Other, mainly wax	do.	29	20
Total	do.	839	1,884

e Estimate. r Revised. NA. Not available.
[1] Data on source countries in 1966 are not available for most commodities.
[2] Scrap, unwrought, and semimanufactures, including alloys.

COMMODITY REVIEW

METALS

Aluminum.—Further agreement with Poland was announced regarding establishment of an aluminum industry. Early in the year, a new protocol to a 1964 economic-technical cooperation plan was signed. Suez was considered the probable location for a proposed reduction plant, rather than Aswan, which had been originally planned. Poland would provide equipment and engineering services at an estimated cost of $18 million. Total cost for the plant, the largest in the Middle

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East, would be $35 million. Annual planned ingot capacity is 40,000 tons, largely for export. Poland would receive ingot in payment for credits advanced. Alumina would be imported from India initially for the proposed plant.

A feasibility study for a possible alumina plant based on the use of low-grade nepheline clay deposits continued in the Aswan area.

On July 23, 1966, a rolling mill, producing aluminum sheet, was officially inaugurated at Helwan.

Iron and Steel.—Insofar as known, operations and development plans showed little progress during 1967. Expansion in the industry was given high priority in planning before the June war, and a special committee was formed to supervise the expansion program. In 1966, $430 million had been budgeted for enlargement of steel production facilities and $200 million for other integrated facilities, such as coking, mining, and transportation.

In January 1967 the Government announced the full nationalization of the Helwan steel plant of Egyption Iron and Steel Co. Arrangements were made to purchase the shares of the private stockholders, including a 20-percent share held by Demag A.G., West Germany, and 29 percent shares held by other European suppliers, Egyptian insurance companies, and private individuals.

In February 1967 the General Organization for Iron and Steel was established under the Ministry of Industry to provide unified management of integrated operations from mining to production of finished steel. The agency was given particular responsibility for the Helwan operation.

The Aswan mine continued as the sole supplier of iron ore to the Helwan steelworks. Ore was selectively mined and upgraded to about 50 percent iron, but was high in silica and phosphorus. Underground mining started at Aswan in 1966. Ore was hauled by barge and 50-ton railcars about 950 kilometers to Helwan.

Development work was delayed at the Baharia Oasis deposit in the Western Desert, 320 kilometers southwest of Cairo; proved reserves here reportedly totaled 200 million tons of ore of a higher grade than that at Aswan. Before the June war, an annual mining rate of 4 million tons to supply Helwan's anticipated expanded requirements was planned, but this was later reduced to 2.5 million tons. Rail construction from the mine to Helwan, delayed by financial problems, is planned for completion in 1969. The U.S.S.R. continued to provide assistance in mine development.

The Helwan steelworks operated substantially below its annual capacity of 315,000 tons of ingot. Facilities included two Martin furnaces, two 15-ton Thomas converters, two 12-ton electric arc furnaces a sinter plant, and a rolling mill. Expansion, with U.S.S.R. assistance, was underway on hot and cold sheet-rolling, tinning and galvanizing facilities, and a plate mill. Annual capacity for rolled steel was scheduled for expansion to 750,000 tons in three stages. Redesigned ingot capacity is 1.5 million tons. Long-range planning included four blast furnaces, sintering capacity of 3.5 million tons, three 80-ton oxygen converters, and two continuous casting units. The war in June necessitated revisions in planning, but the Helwan steelworks continued as a high-priority project.

Manganese.—Before the June war and the Israeli occupation of the Sinai Peninsula, the U.A.R. planned to develop the large low-grade manganese deposit (35 percent iron, 21 percent manganese) at Um Bogma on the Peninsula. The ore was to be hauled by cableway to the coastal area and then by rail to a ferromanganese smelter under construction at Abu Zuniema.

Titanium.—Beach sand deposits of Egyptian Black Sands Co. at Rosetta were considered commercial. Proved reserves were 4.6 million tons of commercial mineral in the sands; probable reserves were 40 million tons.[5] The black sand is composed of 50 percent ilmenite, 20 percent magnetite, 7 percent zircon, 5 percent garnet, 1.5 percent rutile, and 0.2 percent monazite.

NONMETALS

Cement.—Production of four cement plants exceeded requirements of numerous housing and industrial projects. Exports in 1966 of 375,354 tons included 352,974 tons of portland cement; the remainder

[5] United Nations Economic and Social Council, Economic Commission for Africa. Seminar on New Metals and Minerals. Addis Ababa, Ethiopia, February 1968, p. 2.

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was special cements. Plans call for expansion of annual portland capacity from 2.4 million tons to 4 million tons by 1970.

Fertilizer Materials.—Production of fertilizers was given high priority in government planning for the chemical industry. Expansion was underway in several sectors, but demand grew at a faster rate, particularly for nitrogenous types, and substantial quantities were imported. Increased demand was expected for use in reclaimed land irrigated by water from the Aswan Dam. Fertilizers were distributed through companies affiliated with the Egyptian General Agricultural Cooperative Organization, an agency of the Ministry of Agriculture.

The industry experienced difficulties due to shortages of raw material, spare parts for machinery and equipment, and experienced technical personnel, and to irregular supply of refinery gases.

Nitrogenous.—Major import sources were Italy, $12.5 million, United States, $5.95 million, and East Germany, $2.9 million.

Output by type in 1965 and 1966, the latest years for which such data were available, was as follows:

Commodity and plant	Thousand metric tons	
	1965	1966
Ammonium and calcium nitrates, 26 percent N, Aswan	377	392
Calcium nitrate, 15.5 percent N, Suez	278	261
Ammonium sulfate, 20.6 percent N, Suez [1]	60	98
Total	715	751

[1] Operated at only partial capacity.

At the Suez plant of Nasr Fertilizers and Chemicals Co., construction on ammonium nitrate and calcium nitrate lines was delayed. Planned annual capacity was 360,000 tons, 20.5 percent nitrogen. Nearby limestone deposits and gases from a new petroleum coking plant were to be utilized as raw materials.

At the Helwan plant of Nasr Coke and Basic Chemicals Co., construction continued on an ammonium nitrate line, having a capacity of 200,000 tons per year, of 20.5 percent nitrogen. Coke oven gases were to be used as fuel. A urea plant, capacity 760,000 tons per year, 46 percent nitrogen, was planned at either Alexandria or Suez, using steam pressure conversion of naphtha from petroleum refining. Ammonium nitrate and calcium nitrate lines were probably completed at Aswan.

Phosphatic.—Production of phosphate rock recovered from the 1965 slump and reached a new high in 1966. Output of manufactured phosphatic fertilizers included 276,921 tons of superphosphate (252,617 tons in 1965); the remainder was largely Thomas slag from the Helwan steelworks.

Projects for expansion in mining and concentration of phosphate rock, mainly for export, included planned annual capacity of 600,000 tons at Hamrawein, 600,000 tons at Safaga, 800,000 tons at Kosseir, and 1 million tons (nearly double the existing rate) in the Nile valley. At Safaga where phosphate rock is crushed and screened to produce a grade of 63 to 65 percent bone phosphate of lime (B.P.L.) at a rate of 15,000 tons per month, further upgrading to 76 percent B.P.L. by calcining and washing was planned.

The U.A.R. was virtually self-sufficient in phosphatic fertilizers in 1966, and imports were curtailed. Superphosphate expansion was essentially completed at Abu Zaabal. Little progress was made toward the proposed 200,000-ton superphosphate plant at Assiut. A 235,000-ton superphosphate plant was proposed for location at either Aswan or Sebaiya, exploiting the Sebaiya phosphate rock deposit, with power supplied from the Aswan High Dam.

Increases in output of sulfuric and nitric acids were anticipated in connection with the fertilizers industry. A new sulfuric acid unit was completed at the Kafr El Zayat superphosphate plant. Government planners considered the feasibility of a 250,000-ton sulfuric acid plant at Suez, using local gypsum deposits; another at Assiut; and renovation of the existing installation at Abu Zaabal. These projects would augment sulfuric acid output to nearly 600,000 tons annually. Expansion of nitric acid output included plans for enlargement of existing facilities of the Aswan and Suez nitrogenous fertilizer plants and a new facility at Helwan.

Gypsum.—Plans were made for expansion at the Ballah plant by addition of a new furnace. Increased capacity would

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be 20,000 tons per year for construction use and 140,000 tons per year for agricultural use.

MINERAL FUELS

Coal and Coke.—Exploration and development of El Maghara coal on Sinai Peninsula, with Polish assistance, was terminated by the Israeli occupation of the area. Pilot-stage mining had begun as a training measure, and small tonnages of coal were produced for local consumption.

The coal reportedly lies in two seams dipping 15 degrees and has more than 50 percent volatiles. It was graded as weakly coking coal. Tests were underway to determine its possible use in a mixture with imported coking coal. According to U.A.R. authorities coal reserves at El Maghara were estimated at 40 million tons proved and 11 million tons probable. A 41-kilometer hard surface road was built from Ismailia to the mine.

Total coking capacity was 340,000 tons with new facilities at Suez and Helwan. A second battery was planned for Helwan, which would double existing capacity.

Petroleum.—Continued success in oil and gas exploration, progress in field development, and significant agreements concerning the U.A.R. Government, private foreign companies, and foreign governments characterized the petroleum sector in 1967. Growth and potential for further growth were highlights in the Egyptian economy, as the petroleum sector became more important as an earner of badly needed foreign exchange. The U.A.R. took active steps to encourage and promote this expansion. The Government planned joint partnerships between foreign companies and Egyptian General Petroleum Corp. (EGPC), the national oil company, in exploring open areas. Following important recent discoveries, eight international oil companies, including three U.S. companies, submitted offers for open acreage in the Western Desert, Nile Valley, and Red Sea areas.

Crude Oil.—Estimated crude oil reserves totaled 945 million barrels in 1966, and 1 to 2 billion barrels in 1967, compared with reserves of 345 million barrels in 1960. Unofficial reserves in the newly productive El Morgan field in the Gulf of Suez were 1 to 1.5 billion barrels.[6]

Production decreased slightly in 1966, mainly because yields were reduced at several small fields. Output in 1967 was probably at a rate similar to that of 1966, with yields from new wells compensating for losses resulting from the war. Specific data on effects of the conflict on U.A.R. crude output were not available; but continued development of large new fields indicates greatly expanded output after 1967.

Production by field in 1966 was as follows:

Oilfield	Thousand barrels
Belayim (land)	15,995
Belayim (marine)	13,808
Ras Bakr	5,817
Ras Gharib	3,114
Rudeis	939
Ekma	858
Kareem	815
Sudr	783
Asl	619
Sidri	444
Ras Amr	328
Other	550
Total	44,070

Crude production started in April at El Morgan, the country's largest oilfield, about 240 kilometers from Suez in the Gulf of Suez. The field was dedicated on May 25, and development proceeded normally throughout the year. At yearend, 14 wells produced at a rate of 100,000 barrels per day. By the end of 1968 a rate of 150,000 barrels per day is anticipated. Full development, probably in 1970, may reach 300,000 barrels per day from at least 36 wells.[7] Six platforms have been erected for directional drilling. Total investment was estimated at $60 million from 1967 to 1969 of which the EGPC share is $20.5 million. The EGPC share was financed by a $7 million advance from Pan American U.A.R. Oil Co., equal partner with EGPC, and loans from the U.S. Bankers Trust Co. ($7 million) and Chase Manhattan Bank ($6.5 million).

Pan American and EGPC formed Gulf of Suez Petroleum Co. (GUPCO) in 1966 as an operating company. Under their agreement, each party has equal shares, but each contributes 10 percent of its share of output to a U.A.R. authority; therefore, the U.A.R. actually has a 60

[6] Oil and Gas Journal. V. 65, No. 19, May 8, 1967, p. 72.
[7] Work cited in footnote 6.

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percent share. Pan American has the right to export one-half of its share of crude, but EGPC may purchase the remaining half of Pan American's share, if needed. An export price of $1.35 per barrel was agreed upon,[8] and initially, EGPC will deliver its share to Pan American at this price.

The discovery well at El Morgan struck oil at 5,700 feet in the Miocene Kareem Formation. There are two producing zones and total pay sand is 700 feet thick. The oil is of good quality, paraffinic, low sulfur, and 30.5 to 32° API gravity.

Construction of terminal facilities was started at Ras Shukheir in late 1965. Installations include two 18-inch pipelines from the field to shore, four 268,000-barrel storage tanks (to be increased to eight), a 70,000-barrel-per-day separator (to be doubled in the near future), and a 36-inch line from storage to two tanker loading berths capable of loading 40,000 barrels per hour in 100,000 deadweight-ton (dwt) tankers.

Pan American announced discoveries in other parts of the Gulf of Suez and also was drilling its concession in the Western Desert.

The second major oil strike in recent years is the El Alamein oilfield, discovered by Phillips Petroleum Co. in its Western Desert concession in late 1966. This was the first discovery in this large region and spurred exploration activity in the Western Desert.

The discovery well, El Alamein 1—X, 32 kilometers south of the city of El Alamein, was completed at 14,405 feet in November 1966. It tested at 8,659 barrels per day of 34° API gravity, low sulfur, paraffinic oil from two ½-inch chokes and was considered capable of more than 10,000 barrels per day with larger equipment. The pay zone in Lower Cretaceous dolomite is 250 feet thick, perforated at 8,196 to 8,281 feet.[9] Early reserves estimates were 260 million barrels.[10]

The well was shut-in in March while tenders were received for development drilling and pipeline construction. Planned facilities included a 16-inch pipeline, 40 kilometers long, from wellhead to a terminal at Ras Shakik, due north of the well; three 268,000 barrel storage tanks, 2 kilometers inland from Mersa El Hamra, a small bay on the Mediterranean; and two 24-inch lines from the storage tanks, 5.5 kilometers to a mooring buoy at sea, capable of handling 100,000-dwt vessels.[11]

Phillips planned initial output of 30,000 barrels per day, which would probably be doubled later. Development drilling was underway at yearend. The concession area comprised 96,000 square kilometers, including territorial waters to 30 kilometers offshore.

The discovery well was the second drilled by Phillips in the Western Desert; the first was abandoned dry at Alam el Bueib at a depth of 15,500 feet. A third well, 16 kilometers from El Alamein 1–X, was dry at 10,500 feet. The company's fourth well, Qattara Rim No. 1, 48 kilometers southwest of El Alamein 1—X, struck oil at 5,200 feet in the Nubian sandstone. However, there was virtually no gas lift; the well was considered noncommercial[12] and was abandoned at about 13,000 feet in October.

Western Desert Petroleum Co. (WEPCO), the operating company, was formed in equal shares by Phillips and EGPC. Initial development costs were estimated at $12 million, with EGPC providing its share in local currency. Fourteen wells were planned with EGPC getting 65 percent of the output and Phillips the remainder. EGPC also was to receive three-fourths of the profits.[13]

EGPC continued geological and geophysical surveys in uncommitted acreage in the Red Sea area and the Western Desert with U.S.S.R. assistance. In December an agreement was signed whereby the U.S.S.R. would provide $46 million in assistance and equipment for a 7-year exploration program in the Western Desert. Drilling was expected to start in the Siwa Oasis area in 1968.

EGPC made a significant wildcat discovery onshore near the El Morgan terminal at Ras Shukheir in late 1966. High-quality oil of 35.9° API gravity was struck at 2,500 feet. Tests indicated a 1,500- to 3,000-barrel-per-day yield. Development

[8] Petroleum Intelligence Weekly. Jan 30, 1967, pp. 1–2.
[9] World Oil. V. 164, No. 4, March 1967, pp. 69–72.
[10] Journal of Commerce. V. 296, No. 21,713, June 24, 1968, p. 10.
[11] U.S. Consulate Alexandria, U.A.R. State Department Airgram A–85, May 17, 1967, 2 pp.
[12] Petroleum Press Service. V. 34, No. 6, June 1967, p. 223.
[13] Oil and Gas Journal. V. 65, No. 9, Feb. 27, 1967, p.87.

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drilling was underway in 1967. An 8-inch, 20-kilometer pipeline was under construction to the El Morgan terminal.

Compagnie Orientale des Pétroles (COPE), a 50–50 partnership of EGPC and Ente Nazionale Idrocarburi (ENI), the Italian national company, operated several fields including the important Belayim land field on Sinai Peninsula, occupied by the Israelis in June. Exploration and development continued in the Gulf of Suez.

Refineries.—Expansion programs were in progress at the three U.A.R. oil refineries when Israeli artillery bombarded the two refineries at Suez—The Suez Oil Processing Co. plant (annual capacity 64,000 barrels per day) and the Nasr Petroleum Co. plant (90,000 barrels per day). The latter was almost completely destroyed; the former was extensively damaged but was returned to operation at about 50 percent of capacity near yearend. The expansion was to have raised total annual capacity from 180,000 to 260,000 barrels per day and provide surplus petroleum products for the export markets.[14]

The Alexandria refinery of Alexandria Petroleum Co. not affected by the military action, processed mainly U.S.S.R. and Libyan crude oil after the June war and operated at maximum capacity. Increased imports of refinery products for domestic requirements were expected to cost $8 to $9 million per month.[15]

After 2 weeks' negotiations between EGPC and British Petroleum (BP) in London, BP agreed to refine El Morgan crude at its Aden refinery, the refined products to be supplied to the Egyptian market. The agreement was for November and December at a rate up to 48,000 barrels of crude per day and on a month-to-month basis in 1968. The agreement could be terminated by either party on 20 days' notice. El Morgan crude and Aden products were shipped in U.A.R. and U.S.S.R. tankers. Processing fees were to be paid in sterling.[16]

The U.A.R. attempted to meet oil requirements following the loss of refinery capacity by swapping El Morgan crude for refinery products and by outright purchases of products in Rome, Algiers, and London. A tanker shortage in the Mediterranean area caused difficulties.[17]

Natural Gas.—International Egyptian Oil Co. (IEOC), an equal partnership of COPE and ENI, completed two successful gas wells, Abu Madi 1 and 2 in the northern part of the Nile Delta. Abu Madi 1 was shut-in at 11,647 feet. In May, Abu Madi 2 struck gas with 50 percent liquids at 11,326 feet from 200 feet of pay sand. Development was given high priority by EGPC, which called in foreign technicians for preparation of distribution plans. Seven more development wells, a pipeline to Cairo and Helwan, and production of 176 million cubic feet per day were considered. Reserves were estimated at 2.5 trillion cubic feet.[18]

Pan American announced a wildcat gas discovery near the village of Fayoum in the Western Desert near yearend. The expected yield was 5 million cubic feet per day from a depth of 6,400 feet. Further drilling was planned. This discovery was significant as the first indication of the presence of hydrocarbons south of the Qattara Depression.

[14] Oil and Gas Journal. V. 65, No. 32, Aug. 7, 1967 p. 101.
[15] Petroleum Intelligence Weekly. Oct. 30, 1967, p. 3.
[16] Oil and Gas International. V. 7, No. 12, December 1967, pp. 130, 135.
[17] Petroleum Intelligence Weekly. Nov. 6, 1967, pp. 5–6.
[18] Oil and Gas Journal. V. 65, No. 49, Dec. 4, 1967, p. 62.

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The Mineral Industry of the United Kingdom

By Columbus R. Gentile [1] and Edgar L. McGinnis [2]

In 1967, conditions in the United Kingdom's minerals industry for the most part, were in keeping with the stagnant status of the overall economy that prevailed through the year. The Gross Domestic Product (at factor cost—1958 prices) rose slightly, 1.3 percent and industrial production fell by 0.3 percent. Government restrictions remained in effect to slow down rising wages, prices, and consumer spending, with the goal of restraining inflationary pressures and improving the nation's balance of payments position. Notable developments during 1967 were the devaluation of the pound sterling on November 18 by 14.3 percent; nationalization, or more appropriately renationalization, of most of the steel industry on July 28 (Vesting Day); issuance of the Government White Paper outlining the nation's fuel policy for the years ahead; progress on development of offshore natural gas resources including the first pipeline movement to the British mainland; and agreement between the Government and selected producers relative to purchase price of offshore gas.

The production index for mining and quarrying was down 1.1 percent in 1967 from that of 1966; nevertheless by year-end some sectors of the mineral industries began to show improvement. Steel output recovered during the last quarter of 1967 (up about 7 percent over the comparable quarter of 1966), although production for the year was below that of 1966. With the Government takeover of the industry in mid-1967, plans were advanced for improvements and changes in production, distribution, and marketing of products, while increased sales in foreign markets were anticipated because of lower prices stemming from devaluation of the pound sterling. Meanwhile, indigenous iron ore producers were confronted with increased competition from lower priced ore from outside the country. Announcement of plans for construction of three aluminum smelters in the United Kingdom brought strong protests from Britian's major foreign suppliers of ingots. Exploration for indigenous sources of tin, lead, zinc and other minerals was stepped up during 1967 and mining companies continued to press for more generous incentives to encourage the search for minerals. A spurt in construction and building activity helped stimulate the output of nonmetallic minerals and associated products. Activity in virtually all components of the natural gas and petroleum industries was stepped up during 1967; both fuels increased their share of the indigenous energy market, mostly at the expense of coal. Construction of petroleum refineries, pipelines, and other associated facilities continued at a rapid pace, in line with rising demand for oil products at home and abroad. In the natural gas sector, activity was centered on the extension of the pipeline distribution system, storage, and other facilities, including conversion of burning units, since natural gas from offshore British fields began to move to the mainland in quantity. Agreement in 1967 on the price of natural gas to be purchased by the Government from the Phillips Petroleum Group paved the way for increased movement of gas at an early date. Meanwhile, negotiations on price agreement with other companies continued. Estimates of natural gas reserves were increased with the reported discovery of several new offshore deposits. No significant finds of offshore oil reserves

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[2] International economist, Division of International Activities.

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were reported in 1967, but exploration efforts were continuing at yearend.

The process of planned contraction in the coal industry was pursued in 1967, but was slowed because of the high unemployment rate and related social problems in the coal mining areas. Lower levels of coal consumption were registered by gasworks, steel plants, most industrial plants, and railroads, while in the space heating sector coal continued to be displaced by oil fuels, and more recently, by natural gas. Demand remained strong for coal used to generate electric power, because of government pressure and subsidy payments. Meanwhile coal stocks remained at a high level. Success of the coal mine rationalization program was reflected in industry statistics, which showed further declines in manpower, higher worker productivity, and some production cost stabilization.

PRODUCTION

Among nonmetallic mineral commodities, the more significant production gains were registered by barite (19.4 percent), fluorspar (12.7 percent), limestone (11.7 percent), china clay (6.1 percent), gypsum and anhydrite (5.4 percent), and cement (4.9 percent). The major development in the minerals fuel sector was the production of natural gas in quantity (16.5 billion cubic feet) for the first time, because newly developed offshore fields were activated. Crude petroleum output rose by 14 percent but remained insignificant relative to total requirments. On the other hand, petroleum refinery output rose some 2.5 percent with petrochemical and gasworks feedstock (76 percent) and residual fuel oil (almost 6 percent) showing the more significant changes. Coal output fell by approximately 1 percent, but stocks continued to rise as market losses to competitive fuels continued. Coke production was down nearly 8 percent owing largely to lower steel output and increased use of oil in place of coal at manufactured gas plants. The metal sector featured increases in output of tin ore and concentrates (16 percent), cadmium (14 percent), refined tin (38 percent) and lead (10 percent). Offsetting these were declines in production of steel ingots and castings (2 percent), iron ore with 27 percent Fe content (7 percent), and refined copper (5 percent).

Table 1.—United Kingdom: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Aluminum:					
Primary	31,065	32,220	36,207	37,135	39,000
Secondary	148,970	171,614	177,993	183,610	178,600
Cadmium	112	197	220	183	209
Copper:					
Electrolytic	29,804	30,510	34,838	46,640	48,865
Fire refined	170,736	200,830	201,569	141,822	130,200
Total [1]	200,540	231,340	236,407	188,462	179,065
Brass and bronze ingots	124,849	132,877	135,102	r 137,187	138,537
Iron and steel:					
Iron ore, 27 percent Fe thousand tons	15,151	16,588	15,662	r 13,877	12,944
Pig iron and blast furnace ferroalloys do	14,825	17,551	17,740	15,962	15,374
Steel ingots and castings do	22,881	26,651	27,444	24,705	24,276
Net finished steel deliveries, new material do	17,521	20,611	20,466	r 19,325	19,279
Of which from imported finished steel do	948	1,104	537	777	1,210
Lead:					
Ore and concentrate, lead content	250	180	92	---	---
Refined lead [2] thousand tons	r 159	r 180	r 172	r 175	192
Magnesium	4,735	r 4,770	5,375	r 3,760	e 3,800
Nickel, refined and ferronickel	38,100	38,000	40,500	37,500	e 38,500
Tin:					
Ore and concentrate, tin content long tons	1,226	1,226	1,313	1,272	1,475

See footnotes at end of table.

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Table 1.—United Kingdom: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals—Continued					
Tin—Continued					
Refined:					
Primary—long tons	17,411	16,849	16,494	17,499	23,317
Secondary—do	1,278	2,466	1,869	1,279	2,564
Zinc, slab—thousand tons	101	111	107	101	104
Nonmetals:					
Barite and witherite	55,398	62,000	61,000	31,000	37,000
Calcite	24,400	25,400	24,400	24,400	NA
Cement—thousand tons	14,060	16,966	r 17,191	r 16,750	17,577
Chalk—do	17,568	18,556	r 18,803	18,207	NA
Chert and flint—do	99	142	138	118	NA
Clays:					
China clay [3]—do	1,979	2,124	2,298	2,509	2,663
Fire clay—do	1,712	1,923	r 1,900	1,914	NA
Potters and ball clays—do	602	626	r 647	505	NA
Other clays and shale—do	r 31,783	r 34,675	r 35,056	34,642	NA
Diatomite—do	14	14	r 15	15	NA
Fluorspar—do	r 87	r 104	r 117	r 126	142
Gypsum and anhydrite—do	4,135	4,587	r 4,455	4,358	4,593
Igneous rock—do	19,267	23,314	r 25,213	28,555	NA
Limestone—do	47,878	57,996	60,548	r 68,373	76,375
Salt:					
Rock—do	764	704	735	r 1,047	685
Evaporated—do	1,411	1,369	1,451	1,478	1,413
Other—do	4,320	4,672	4,814	4,808	4,997
Sand:					
For glassmaking—do	1,245	r 1,418	1,390	1,462	1,446
Other silica sand—do	506	736	1,079	968	NA
Molding and pig bed sand—do	846	908	r 843	864	NA
Other industrial sand and gravel—do	r 86,937	r 104,462	r 102,047	r 108,000	107,000
Sandstone—do	5,395	6,927	r 7,256	7,610	NA
Slate—do	125	123	r 102	91	NA
Strontium minerals	9,164	17,306	9,702	9,555	NA
Sulfur, recovered elemental includes sulfur recovered from petroleum refineries	47,275	54,563	r 48,971	r 40,538	NA
Talc, includes steatite and pyrophyllite	8,104	10,318	10,137	e 10,000	e 10,000
Mineral fuels:					
Coal:					
Anthracite—thousand tons	4,226	4,672	4,270	4,523	4,112
Bituminous—do	194,712	192,063	186,238	172,853	170,787
Coke and coke breeze:					
Coke oven coke—do	15,792	17,220	17,381	16,376	15,585
Gashouse coke—do	r 9,875	r 8,942	r 7,893	r 7,317	6,287
Coke breeze, total—do	3,680	3,620	3,430	3,211	NA
Fuel briquets—do	1,679	1,351	920	r 951	1,038
Gas, natural—million cubic feet	200	200	r 449	123	16,527
Carbon black—thousand tons	140	153	160	r 166	163
Petroleum:					
Crude [4]—do	125	129	83	78	89
Refinery products:					
Liquid petroleum gases—do	942	1,228	1,419	r 1,629	1,655
Aviation gasoline—do	145	166	165	128	456
Wide cut gasoline—do	699	847	593	502	
Motor spirit—do	r 6,912	r 7,783	r 8,824	8,816	8,964
Industrial and white spirit—do	r 158	r 166	r 154	175	156
Kerosine, including jet fuel—do	3,132	3,220	3,429	3,852	4,044
Gas/diesel oil—do	10,961	12,185	13,638	14,898	14,229
Fuel oil—do	21,481	23,176	26,288	29,128	30,767
Lubricating oils—do	983	1,053	1,017	1,090	1,011
Bitumen—do	1,326	1,482	1,445	1,601	1,750
Paraffin—do	56	60	54	58	57
Feedstocks for petroleum chemical plants—do	1,502	1,566	2,138	2,581	4,543
Light distillate feedstock for gasworks—do	1,037	1,401	1,550	1,463	
Refinery fuel [5]—do	4,579	4,840	5,203	5,410	5,565
Miscellaneous products—do	258	245	192	388	331
Total—do	54,171	59,418	66,109	71,719	78,528

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Includes copper from imported blister.
[2] Includes lead refined from imported bullion.
[3] Includes some china stone.
[4] Includes petroleum gases.
[5] Includes refinery losses.

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TRADE

The adverse foreign trade balance continued to prevail in 1967 while the Government turned to devaluation as a prime corrective measure. Mineral commodities remained the major contributor to the 1967 negative trade balance, as shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total percent
	Mineral commodities	Total trade	
Exports			
1965	2,193	13,227	16.6
1966	2,319	14,118	16.4
1967 p	2,338	13,876	16.8
Imports:			
1965	4,337	16,138	26.9
1966	4,541	16,671	27.2
1967 p	4,723	17,240	27.4
Trade balance: [1]			
1965	−2,144	−2,911	XX
1966	−2,222	−2,553	XX
1967 p	−2,385	−3,364	XX

p Preliminary. XX Not applicable.
[1] Excludes reexports.

Major mineral commodity exports in 1966, on a value basis, included iron and steel products (25.9 percent), precious and semiprecious stone (24.7 percent), nonferrous metals (23.1 percent), and petroleum products (13.8 percent). Exports of iron and steel products declined in value by some 8 percent to $602 million, but the export value of precious and semiprecious stones, nonferrous metals, and petroleum products rose by 23, 11, and 6 percent repectively.

More than 53 percent of the United Kingdom's 1966 mineral commodity exports moved to West European markets, including 26 percent to countries of the European Economic Community (EEC), and 18 percent to other European Free Trade Association (EFTA) members. The United States remained the largest individual country market, receiving 15 percent of the value total.

Petroleum and refinery products (37.8 percent), nonferrous metals (26 percent), metalliferrous ores and scrap (11.7 percent) remained the most important categories of mineral imports by value. Imports of petroleum and products increased about 1 percent to $1.7 billion, and of nonferrous metals some 15 percent to $1.2 billion. In contrast, imports of metalliferrous ores and scrap valued at $531 million were down about 6 percent.

West European countries provided almost 26 percent of mineral commodity imports in 1966, with EEC countries (17 percent) and other EFTA countries (8 percent) supplying most of that total. Other significant source areas were Africa, excluding Libya and the United Arab Republic (24 percent), the Middle East, including Libya and United Arab Republic (21 percent), and the United States and Canada (15 percent). The United Kingdom's five major individual suppliers based on value of mineral commodity imports were Canada (9.3 percent), Republic of South Africa (6.6 percent), Kuwait (5.7 percent), United States (5.4 percent), and the Netherlands (5.3 percent).

Table 2.—United Kingdom: Exports [1] of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Aluminum oxide and hydroxide	21,251	13,294	Poland 9,566; Finland 1,505.
Metal and alloys:			
Metal, unwrought	24,536	26,031	United States 5,319; Japan 4,824; Sweden 3,119; Canada 1,789.
Semimanufactures	46,439	45,903	Republic of South Africa 3,342; Sweden 2,578; Ireland 2,501; Venezuela 2,411.
Antimony, regulus and refined	1,261	763	NA.
Bismuth	535	330	NA.
Chromium	606	1,551	NA.
Cobalt oxides and hydroxides	374	468	Netherlands 121; Poland 77; Spain 33.

See footnotes at end of table.

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Table 2.—United Kingdom: Exports [1] of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Copper and alloys:			
Unwrought	78,069	92,061	West Germany 20,946; Italy 16,437; Netherlands 9,234; Japan 8,119.
Semimanufactures	78,205	84,892	United States 15,255; Switzerland 8,753; Spain 6,892; Ireland 5,733.
Gold:			
Bullion, refined. thousand troy ounces	76,518	36,952	NA.
Leaf gold do	46	48	NA.
Gold coin do	2,296	1,447	NA.
Iron and steel:			
Scrap thousand tons	430	250	Spain 104; Italy 72; Belgium-Luxembourg 20.
Pig iron and ferroalloys do	129	88	Belgium-Luxembourg 19; United States 19.
Ingots and other primary steel forms. do	296	212	Spain 82; United States 59; Argentina 12.
Semimanufactures:			
Wire rod do	76	72	Mainland China, 19; United States 18; Belgium-Luxembourg 5.
Other bars and rods do	314	271	United States 43; India 28; Canada 19; Sweden 19.
Angles, shapes and sections:			
Heavy do	319	283	United States 77; Canada 22; Australia 19.
Light do	66	49	Spain 6; Canada 5; New Zealand 5; Ireland 4.
Plates and sheets:			
Universals and heavy plate. do	269	253	Norway 38; United States 20; mainland China 19; Denmark 19.
Medium plate do	76	89	Sweden 25; United States 7; mainland China, 7.
Thin plates and sheets:			
Uncoated do	855	975	United States 360; Sweden 89; Spain 55; West Germany 42.
Coated:			
Tin plate and tinned sheets. do	397	375	Republic of South Africa 61; Argentina 38; Spain 29; Denmark 18; Portugal 17; Sweden 17.
Other do	217	215	Finland 33; Norway 20; Sweden 15; New Zealand 14.
Hoop and strip do	96	98	India 11; United States 10; Spain 7; Finland 7; Canada 7.
Railway track material do	306	170	Italy 35; France 24; Mexico 21.
Wire do	126	104	Canada 19; United States 19.
Tubes, pipes and fittings do	550	445	Netherlands 31; New Zealand 31; Canada 28.
Rough castings and forgings. do	42	34	Belgium-Luxembourg 9; Sweden 7; United States 3.
Lead:			
Lead oxides	4,774	4,835	Ireland 946; Sweden 835; West Germany 485; Norway 465.
Metal and alloys:			
Unwrought	42,822	43,901	West Germany 18,071; mainland China 2,845; Netherlands 2,759.
Semimanufactures	1,902	1,794	Venezuela 136; Finland 120; India 81.
Magnesium and alloys, unwrought and semimanufactures.	1,769	1,233	United States 352; France 273; India 88.
Nickel:			
Metal and alloys:			
Unwrought	28,228	25,688	West Germany 8,550; Sweden 4,445; France 3,629.
Semimanufactures	6,829	8,156	France 966; United States 895; Sweden 813; Australia 758.
Platinum group metals. thousand troy ounces	906	NA	
Silver and alloys, unwrought and semimanufactured. do	28,676	NA	
Tin:			
Oxides long tons	r 418	374	Spain 94; Mexico 48.
Metal and alloys:			
Unwrought do	9,275	9,732	U.S.S.R. 2,027; United States 1,543; West Germany 863.
Semimanufactures do	975	608	Norway 277; West Germany 126.
Zinc:			
Zinc oxides	3,688	4,358	Canada 597; Malaysia 570; Ireland 498.

See footnotes at end of table.

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Table 2.—United Kingdom: Exports [1] of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Zinc—Continued			
Metal and alloys:			
Unwrought	1,254	1,117	Ireland 304; United Arab Republic 101; Hong Kong 58.
Semimanufactures	6,289	5,024	Netherlands 676; France 489; Ireland 359; Spain 319.
Nonferrous base metals, n.e.s.:			
Ores and concentrates	16,612	16,968	Belgium-Luxembourg 3,875; Spain 3,740; Netherlands 2,603; Republic of South Africa 1,303.
Scrap	50,697	48,047	West Germany 13,350; Canada 7,328; Belgium-Luxembourg 7,041.
Nonmetals:			
Abrasives, natural, n.e.s.	3,175	3,607	United States 574; Ireland 366; Burma 351.
Asbestos:			
Crude or simply processed	6,040	4,770	West Germany 558; Italy 404; United Arab Republic 372.
Asbestos cement products	38,353	33,858	Ghana 8,811; Hong Kong 2,867; Nigeria 2,565.
Cement, hydraulic thousand tons	281	250	Ghana 70; Libya 15; Nigeria 14.
Clays and refractories:			
China clay and other do	1,877	2,135	West Germany 347; Italy 344; France 225.
Clay construction materials:			
Brick and other nonrefractory. do	71	71	Australia 15; United States 9; Canada 8.
Refractory do	157	147	Netherlands 20; Sweden 19; Australia 12.
Corundum, artificial	809	NA	
Fertilizer materials, manufactured:			
Nitrogenous thousand tons	439	362	Ceylon 130; Malaysia 60.
Other do	55	100	West Germany 23; Sweden 21; Ireland 21.
Lime	38,165	33,340	Nigeria 6,665; Ireland 4,316; Norway 2,838.
Quartz, mica and feldspar	24,463	26,820	Australia 7,187; Canada 3,560; India 2,574; Japan 2,103.
Salt thousand tons	405	454	Sweden 128; Nigeria 90; Denmark 50.
Stone, sand and gravel thousand tons	212	262	West Germany 127; Ireland 96.
Strontium minerals (celestite)	5,528	7,501	NA.
Crude minerals, n.e.s. thousand tons	252	255	Norway 163; Sweden 49.
Slag, scalings, dross, etc do	327	292	West Germany 248; Denmark 27.
Mineral fuels:			
Carbon black	38,466	35,899	NA.
Coal and coal briquets thousand tons	3,889	2,827	France 666; West Germany 429; Netherlands 360.
Coke do	1,009	984	Norway 523; Sweden 134; Portugal 131.
Petroleum:			
Crude and partly refined. thousand tons	272	127	Netherlands 91; East Germany 29.
Refinery products:			
Gasoline do	1,595	1,542	Sweden 468; Denmark 276; Norway 211.
Kerosine do	781	889	Sweden 214; Ireland 204; Denmark 114.
Distillate fuels do	3,881	4,037	Sweden 1,675; Netherlands 697; Denmark 677.
Residual fuel oil do	3,932	4,829	Sweden 1,653; Ireland 416; Netherlands 390.
Lubricating oils and greases. do	596	578	West Germany 47; Republic of South Africa 45; Yugoslavia 36.
Mineral jelly and waxes	5,274	4,573	Nigeria 668; Ireland 655; Portugal 447.
Nonchemical coal and petroleum. thousand tons	246	279	Norway 55; Belgium-Luxembourg 54; Canada 41.
Gas, natural and manufactured do	7	14	Ireland 12.

r Revised. NA Not available.
[1] Excluding reexports.

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Table 3.—United Kingdom: Reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum and alloys, unwrought	183	340	Mainland China 101; Republic of South Africa 41.
Copper and alloys, unwrought	3,321	4,245	Mainland China 1,521; Netherlands 1,167.
Lead and lead alloys, unwrought	5,429	485	Mainland China 199; Israel 133, Ireland 102.
Mercury, 76-pound flasks	13,025	5,337	Japan 957; France 870; East Germany 551.
Nickel and alloys:			
Unwrought	9,895	14,566	West Germany 5,389; Italy 3,521; France 2,572.
Semimanufactures	799	963	Italy 306; United States 227; France 96.
Tin and alloys, unwrought, long tons	180	89	Netherlands 49; Yugoslavia 14.
Zinc and alloys, unwrought	8,270	5,012	Mainland China 2,941; Pakistan 657; Spain 512.
Nonmetals:			
Asbestos, crude or simply processed	152	131	Netherlands 125.
Fertilizer materials, manufactured	2,030	1,016	Ireland 1,011.
Quartz, mica, and feldspar	2,533	3,710	West Germany 1,312; Netherlands 465; Italy 409.
Talc, natural steatite	323	716	Ireland 132; Other West Europe 135.
Mineral fuels: Petroleum refinery products:			
Gasoline	6,523	3,162	All to Ireland.
Kerosine	3,798	1,180	Ireland 1,031.
Distillate fuel oil	4,100	5,082	Netherlands 5,080.
Residual fuel oil	1,201	1,626	All to Ireland.
Lubricating oils, greases	1,573	213	Finland 84; Ireland 65.
Mineral jelly, wax	77	72	West Europe 31.

Table 4.—United Kingdom: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite, thousand tons	474	492	Ghana 323; Greece 69; France 60.
Metal and alloys:			
Scrap, do.	24	16	U.S.S.R. 14.
Unwrought, do.	324	346	Canada 135; Norway 115; United States 28.
Semimanufactures, do.	24	29	Belgium-Luxembourg 8; Ireland 5; Switzerland 3.
Bismuth:			
Metal	397	376	NA.
Alloys	297	152	NA.
Cadmium	1,454	1,052	NA.
Chromite ore and concentrate, thousand tons	205	201	Republic of South Africa 96; Philippines 79; Iran 10.
Cobalt:			
Oxides	872	1,120	Canada 1,117.
Metal	1,833	1,607	NA.
Copper and alloys:			
Ore and concentrate	811	463	Peru 432.
Metal and alloys:			
Scrap	5,758	5,145	Netherlands 873; Canada 784; Ireland 734.
Unwrought:			
Blister, thousand tons	74	37	Chile 27; Zambia 6.
Electrolytic and fire refined, do.	513	474	Zambia 201; Canada 81; Chile 60.
Semimanufactures	7,350	6,425	Canada 2,098; West Germany 986; Sweden 837.
Gold:			
Ore concentrate, jewelers sweeping, etc., estimated gold content, thousand troy ounces	8,200	5,000	NA.
Bullion:			
Unrefined, thousand troy ounces	1,527	764	NA.
Refined, do.	37,885	25,839	NA.
Gold coin, do.	605	72	NA.

See footnotes at end of table.

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Table 4.—United Kingdom: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Iron and steel:			
Iron ore and concentrate:			
Iron ore excluding pyrites. thousand tons	18,608	15,810	Sweden 4,873; Canada 2,188; Mauritania 1,570.
Roasted pyrites do	567	407	Italy 154; Sweden 117; Spain 65.
Scrap do	74	5	Ireland 2; West Germany 1.
Pig iron, including shot and sponge iron. do	333	403	Finland 113; Norway 80; Republic of South Africa 51; U.S.S.R. 41.
Ferromanganese do	82	77	Republic of South Africa 51; Norway 11; France 7.
Other ferroalloys do	227	189	Norway 84; Canada 20; U.S.S.R. 17.
Steel ingots and other primary forms. do	30	122	Australia 39; Spain 35; U.S.S.R. 24.
Semimanufactures:			
Wire rod do	34	61	Belgium-Luxembourg 21; Sweden 17; France 11.
Other bars and rods do	104	160	Norway 58; Sweden 33; Belgium-Luxembourg 21.
Angles, shapes, and sections. do	9	28	West Germany 9; Ireland 6; Norway 4; Sweden 4.
Plates and sheets:			
Heavy and medium plate. do	31	46	Sweden 13; Australia 11; Canada 5.
Thin plates and sheets:			
Uncoated do	236	339	Netherlands 131; Belgium-Luxembourg 49; West Germany 48.
Coated do	18	39	Belgium-Luxembourg 10; Canada 10; Sweden 4.
Hoop and strip do	37	26	Australia 8; Belgium-Luxembourg 7; United States 4.
Tubes, pipes and fittings do	68	80	Netherlands 25; Sweden 15; West Germany 10.
Wire, single strand do	5	6	Sweden 4.
Rough castings and forgings. do	3	3	Mainly from United States.
Lead:			
Ore and concentrate do	22	22	Australia 7; Canada 7; Netherlands 3.
Metal and alloys:			
Scrap	2,713	2,866	East Germany 420; Netherlands 407; Australia 372; Ireland 283.
Unwrought and worked. thousand tons	219	208	Australia 135; Canada 42.
Magnesium and alloys:			
Scrap	350	215	West Germany 153; Belgium-Luxembourg 27.
Unwrought and semimanufactures	r 4,845	5,257	Norway 2,248; Canada 1,408.
Manganese ore and concentrate. thousand tons	503	371	U.S.S.R. 116; Republic of South Africa 114.
Mercury 76-pound flasks	30,487	20,335	Italy 9,863; Spain 6,672.
Nickel:			
Matte and speiss	65,076	58,966	All from Spain.
Metal and alloys:			
Scrap	3,263	2,939	United States 789; France 509; West Germany 398.
Unwrought	26,861	39,067	Canada 18,045; U.S.S.R 13,740.
Semimanufactures	2,847	2,712	United States 2,321.
Platinum group metals, all forms. thousand troy ounces	150	135	NA.
Selenium	178	193	NA.
Silicon	12,000	11,586	NA.
Silver:			
Ore and concentrate	4,176	357	NA.
Unwrought and semimanufactures. thousand troy ounces	46,825	54,834	NA.
Tin:			
Ore and concentrate long tons	45,370	55,708	Bolivia 48,846.
Metal and alloys:			
Scrap do	1,131	834	Netherlands 170; United States 136; Singapore 116.
Unwrought and worked do	9,455	10,307	Nigeria 6,472; Malaysia 2,626.
Titanium, zirconium, etc, ores and concentrates. thousand tons	341	315	Australia 237; Norway 62.
Tungsten ore and concentrate	8,063	7,529	Bolivia 2,266; mainland China 1,240; U.S.S.R. 1,022.
Zinc:			
Ore and concentrate. thousand tons	234	239	Australia 173; Burma 10.
Scrap	1,966	1,233	West Germany 379; Netherlands 232; Sweden 182; Australia 179.

See footnotes at end of table.

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Table 4.—United Kingdom: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Zinc—Continued			
Metal and alloys:			
Unwrought and worked. thousand tons	197	187	Canada 96; Australia 22; Poland 15.
Other:			
Nonferrous ores and concentrates, n.e.s. do	15	14	Republic of South Africa 12.
Metalliferous nonferrous waste, n.e.s. do	65	70	Canada 37; United States 13; East Germany 5.
Nonferrous base metals, n.e.s.:			
Tungsten, molybdenum, tantalum, etc.	13,831	12,790	United States 2,526; Norway 2,248; Canada 2,134; Zambia 1,258.
Nonmetals:			
Asbestos:			
Crude thousand tons	179	194	Canada 119; Republic of South Africa 57.
Asbestos cement products do	34	30	Belgium-Luxembourg 12; Ireland 11; France 5.
Barite and witherite do	68	58	Morocco 15; Spain 14; mainland China 11.
Boron:			
Crude natural borates do	43	43	Netherlands 26; Turkey 13.
Borax do	22	21	NA.
Cement hydraulic do	1,126	414	Ireland 287; Denmark 86.
Chalk	1,099	660	France 634.
Clays and clay products. thousand tons	112	114	United States 50; Republic of South Africa 35.
Clay construction materials (nonrefractory). do	21	14	Belgium-Luxembourg 4; Japan 3; Sweden 2.
Cryolite, chiolite natural	2,534	2,478	All from Denmark.
Diatomite and other siliceous earths	46,664	43,041	NA.
Dolomite	13,976	19,620	Norway 13,031; Spain 4,836.
Feldspar and fluorspar thousand tons	98	117	Norway 84; Canada 12.
Fertilizer materials:			
Nitrogenous:			
Sodium nitrate, natural do	18	19	All from Chile.
Manufactured do	269	183	West Germany 90; Netherlands 54; Ireland 18.
Phosphatic:			
Phosphate rock do	1,694	1,665	Morocco 843; United States 332; Senegal 182.
Manufactured do	60	46	Belgium-Luxembourg 28; France 16.
Potassic:			
Potash salts, crude natural. do	38	36	East Germany 31.
Manufactured do	728	688	East Germany 185; France 126; West Germany 123.
Crude fertilizers, n.e.s. do	13	17	Ireland 16.
Manufactured fertilizers, n.e.s. do	143	161	Netherlands 145; Chile 11.
Graphite, natural	10,516	10,263	Malagasy Republic 4,942; Ceylon 2,185.
Gypsum, crude and calcined. thousand tons	159	150	Ireland 99; France 51.
Magnesite do	110	111	Greece 25; Austria 22; Italy 17; Czechoslovakia 15.
Mica do	14	10	India 7; Republic of South Africa 2.
Pigments, earth colors, etc	8,093	5,303	Republic of South Africa 1,771; Austria 1,272; Cyprus 1,204.
Pumice and other natural abrasives	14,046	21,783	NA.
Pyrites, unroasted thousand tons	228	268	Cyprus 137; U.S.S.R. 47; Sweden 41; Spain 31.
Quartz, natural, quartzite do	17	14	Norway 7; Sweden 5.
Refractory construction materials, n.e.s. do	63	63	Austria 21; Ireland 13; Denmark 11.
Salt do	60	62	West Germany 41; Spain 8; Poland 8.
Stone, sand and gravel:			
Building and dimension stone (rough cut). do	43	34	Italy 20; Sweden 5.
Dimension stone worked do	21	21	Portugal 14; Italy 3.
Natural sands, not mineral bearing. do	207	246	Belgium-Luxembourg 198; Netherlands 35.
Gravel and crushed stone do	138	149	Ireland 73; Italy 25; France 22.
Talc and soapstone do	47	49	Norway 21; France 9; Italy 7.
Crude minerals, n.e.s do	r 154	150	Italy 68; Republic South Africa 33.
Slag, scalings, dross, nonmetal-bearing. do	65	42	Sweden 25; Ireland 12.

See footnotes at end of table.

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Table 4.—United Kingdom: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Mineral fuels:			
Asphalt and bitumen, natural. thousand tons	83	79	Trinidad and Tobago 43; France 21.
Coal, coke and briquets do	56	87	Ireland 73; Belgium-Luxembourg 7.
Gas, natural and manufactured do	703	855	Algeria 492; Netherlands 102; United States 94.
Petroleum:			
Crude and partly refined for further refining. do	67,165	71,489	Kuwait 15,916; Iraq 10,538; Libya 10,190; Nigeria 7,074.
Refinery products.			
Gasoline, including blending components. do	3,419	3,670	Netherlands 884; Italy 512; France 353.
Kerosine do	3,138	4,014	Netherlands 827; Italy 513; Aden 454.
Distillate fuel oil do	3,011	3,806	Italy 1,278; France 387; Netherlands 368.
Residual fuel oil do	9,992	9,520	Italy 2,899; Netherlands 1,861; France 1,336; Venezuela 1,033.
Lubricating oils do	559	612	United States 184; Netherlands Antilles 139; Venezuela 94.
Mineral jelly and waxes do	123	116	Netherlands Antilles 67; Venezuela 20.
Petroleum coke do	94	95	Netherlands 41; United States 39.

r Revised. NA Not available.

COMMODITY REVIEW

METALS

Aluminum.—Announcement that three primary aluminum smelters were to be built in the United Kingdom touched off strong protests from Norway and Canada, principal suppliers of aluminum ingots to the United Kingdom. The Norwegian Government claimed that this action was contrary to principles of European Free Trade Association (EFTA). At yearend 1967, however, no action had been taken on plans for the construction of a smelter by Aluminum Company of Canada LTD. (ALCAN) at Blyth or Tynside, Scotland, another by Rio Tinto-Zinc Corp. (RTZ) at Holyhead in North Wales, and a third by British Aluminium Company (BAC) at Invergordon, Scotland. Initial annual capacity of the ALCAN and BAC smelters is planned at 60,000 tons, with eventual expansion to 120,000 tons per year. The RTZ unit would have an initial yearly capacity of 120,000 tons with expansion to 240,000 tons to follow.

In 1967, roughly 90 percent of the aluminum ingots consumed in the United Kingdom were imported. Small domestic primary output has been obtained from BAC facilities at Fort William and Kinlochleven, Scotland.

Iron and Steel.—Reflecting the general slowdown in economic growth in 1967, production of pig iron, and steel ingots and castings remained rather stagnant, while output of iron ore (27 percent Fe) declined for the third consecutive year. The major development in the iron and steel sector during the year was nationalization of the industry with the major part coming under public ownership on Vesting Day, July 28, 1967. A public authority, the National Steel Corporation (the name was subsequently changed to the British Steel Corporation) was established with members appointed by and reponsible to the Ministry of Power. The Act nationalized only those companies or groups of companies that produced more than 475,000 tons of crude steel during the year ended June 30, 1964. Fourteen major steel companies were included and now form part of the British Steel Corporation (BSC). The companies are as follows:

Colvilles, Ltd.
Consett Iron Co., Ltd.
Dorman, Long and Company, Ltd.
English Steel Corporation, Ltd.
G.K.N. Steel Company, Ltd.
John Summers and Sons, Ltd.
Lancashire Steel Corporation, Ltd.

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Park Gate Iron and Steel Corporation, Ltd.
Richard Thomas and Baldwins, Ltd.
Round Oak Steel Works, Ltd.[1]
South Durham Steel and Iron Company, Ltd.
Steel Company of Wales, Ltd.
Stewarts and Lloyds, Ltd.
United Steel Companies, Ltd.

[1] Since Vesting Day half the equity of Round Oak Steel Works, Ltd., has been transferred to Tube Investments, Ltd., and the plant is no longer in full public ownership.

In 1966, the firms which now comprise the public sector had a turnover of $2.8 billion, employed almost 270,000 workers, and controlled the bulk of the production, including nearly all of the pig iron, crude carbon steel, and heavy products, but a much smaller proportion (less than 50 percent, in some cases) of the output of light products and alloy steels. Nevertheless, the remaining private sector of the industry was quite formidable. At Vesting Day it comprised some 250 iron and steel companies and about 1,200 iron and steel foundries with a combined turnover of $1.1 billion to $1.4 billion and a work force of about 200,000.

The public sector at Vesting Day was organized into four groups as follows:

Group	Capital [1] (millions)	Crude steel output [1] (million long tons)	Employees, iron and steel and other activities [1]
Midland	$943.6	5.8	68,500
Northern and Tubes	1,024.8	5.6	95,500
Scottish and North West	806.4	4.6	47,400
South Wales	1,164.8	6.1	57,100
Total	3,939.6	22.1	268,500

[1] 1966 data.

The groups are responsible to the BSC but have a considerable degree of operating autonomy within concepts of the Act and established guidelines of the corporation.

Steel production in the United Kingdom in 1967 was approximately 1.7 percent below that for 1966 and 11.7 percent less than the record 27.4 million tons attained in 1965. A feature of the 1967 output was the recovery in the final quarter, when output reached 6.2 million tons compared with 5.5 million tons in the same quarter of 1966. Capacity utilization in 1967 fell by 2 points to 77 percent, but in the last quarter of the year was up 6 points from the comparable quarter of 1966.

Lead and Zinc.—Initial production of zinc and lead was attained in December 1967 at the new smelter at Avonmouth, that has a rated annual capacity of 90,000 tons, which can be increased to 140,000 tons with the addition of special units. The smelter, Avonmouth No. 4, was constructed by Imperial Smelting Co., Ltd. (a subsidiary of Rio Tinto Zinc), the only primary zinc producer in the United Kingdom. The new unit can process sintered zinc-lead concentrates to recover both zinc and lead. Recovery of cadmium and sulfuric acid as byproducts is also contemplated. When the plant attains full production, a nearby Imperial smelter, Avonmouth No. 2, will be shut down, but a unit at Swansea will remain active.

Renewed interest in exploration for lead-zinc deposits was evident during 1967. Minera Mines Ltd., a subsidiary of Charter Consolidated, Ltd., carried out prospecting and drilling programs in several areas of Wales, and New Davies Petroleum, Ltd., a Canadian Company, conducted similar operations in the Strontian area of Scotland.

Tin.—The Cornwall region, once a prominent world source of copper and tin, was again the center of exploration and development activity. A number of British and foreign mining companies were reopening old tin mines and probing for virgin deposits, both onshore and offshore. This renewed activity has been stimulated somewhat by the capital investment grant of 45 percent allowed by the Government for investments in districts designated as development areas. Operations were underway at a number of locations in Cornwall, including areas near Camborne, Wheal Vor, Redruth, Godolphin, and Bodmin. At Pendeen, near Redruth, the Barcos Mining Company Limited of the Johannesburg Consolidated Investment Group proceeded with work on a mine shaft following encouraging results from a drilling program. Costal Prospecting Company Limited has completed a processing mill adjacent to the St. Ives Bay area where suction dredging of tin bearing sludge is underway.

Uranium.—Ore containing uranium has been found in bituminous shale on the

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island of Stroma in the Pentland Firth, Scotland. Meanwhile, a 5-year uranium prospecting program has been started with initial reconnaisance to be made in select areas followed by extensive prospecting at the more promising locations.

NONMETALS

Cement.—Activity in the public sector was largely responsible for the 4.9-percent increase in cement production in 1967, nevertheless more than 1.5 million tons of capacity remaind idle. Cement manufacturers have embarked on a program of taking old plants out of service and either building new works or installing larger more modern units at selected existing works. Five new plants or large kilns were under construction in late 1967, and contracts had been let for expansion of two other units. Late in 1967, Tunnel Portland Cement Company announced plans to expand capacity of its cement mill at Pitstone, in Buckinghamshire, to roughly 1 million tons yearly by 1969, giving the company, which also has a plant at West Thurrock, the two largest cement works in the United Kingdom.

Fertilizer Materials. — *Potash.* — Cleveland Potash, Ltd., owned jointly by Imperial Chemical Industries, Ltd. (ICI) and Charter Consolidated, Ltd. (an affiliate of Anglo American Corporation) made plans to develop the United Kingdom's first potash mine near Staithes, 16 kilometers north of Whitby, Yorkshire. Initial annual production capacity would be 1 million to 1.5 million tons. Exploration and drilling activity indicated the presence of ore beds 8 meters thick at a depth of 1,100 to 1,200 meters. The ore grade ranges between 26 and 30 percent K_2O equivalent. Development of the mine was slated to start in 1969, with full production attained in 1972 or 1973. Company officials indicate unproved offshore reserves may be substantially larger than onshore findings.

Output of 1 million to 1.5 million tons will be adequate to meet demands of the internal market, estimated at 850,000 tons by 1970, with the balance available for export. Imports in 1967 amounted to approximately 750,000 tons. Proposals have been advanced for the development of port facilities at nearby Teeside to handle exports of potash and imports of iron ore.

Two other companies, Rio Tinto Finance and Exploration, a unit of Rio Tinto-Zinc Corporation, and Armour Chemical Company have also initiated exploration activity in the Whitby area.

Fluorspar.—The upward trend of fluorspar production continued in 1967 exceeding output in 1966 by almost 13 percent. Production at the Sallet Hole fluorspar and barite mine in Derbyshire, owned by Laport Industries Limited and operated by Glebe Mines, a unit of the General Chemicals Division, is to be doubled within the next 5 years to attain an output of roughly 800 tons daily. The mine is one of the leading world producers of fluorspar.

Gypsum and Anhydrite.—British Gypsum Ltd. discontinued operations at the Cocksdale mine in Cumberland in 1967, but new mines were being developed in Cumberland and in Yorkshire. The company's reserves of high-grade gypsum and anhydrite ores have been increased with the acquisition of Bellrock Gypsum Industries, Ltd.

MINERAL FUELS

Substantially increased oil and gas consumption and a further decline in coal consumption, against a background of slightly higher energy demand, characterized the mineral fuel economy in 1967. Oil and gas sales each rose 7.7 percent while coal sales declined 8 percent. Demand for all mineral fuels was adversely affected by the low level of general economic activity and mild weather in early 1967. Oil imports were interrupted by the Middle East war, but major supply problems were avoided by government-industry coordination.

The emergence of natural gas as a major indigenous primary energy source prompted a governmental review of fuel policy in 1967, the results of which were published [3] in the Ministry of Power's White Paper on Fuel Policy in November.

The White Paper indicated that although the predominance of coal and oil as primary fuel sources would continue for many years, they would meet increasingly strong competition from natural gas and nuclear power. The likely pattern of fuel

[3] Ministry of Power. Fuel Policy. Command 3438. Her Majesty's Stationery Office (London). November 1967.

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use in the mid-1970's as set out in the White Paper was as follows:

Commodity	Million tons of coal equivalent			
	Actual use		Estimated use	
	1957	1966	1970	1975
Coal	212.9	174.7	[1] 152	[1] 120
Oil	36.7	111.7	125	145
Nuclear and hydroelectric	1.7	10.2	16	35
Natural gas	-----	1.1	17	50
Total	251.3	297.7	310	350

[1] Exports of coal estimated at about 3 million tons in 1970 and 2 million tons in 1975.

Indications are that by 1975 the growing use of nuclear power and natural gas will severely limit the market for coal, while petroleum will hold or slightly increase its share of the total energy market.

Although the Government considers that contraction of coal demand to the level projected for 1975 would be manageable, the rate of contraction implied for 1970 would cause unmanageable difficulties for the industry. To soften the impact on the industry and secure an orderly transition to lower demand, the Government provided for the use of about 6 million tons of additional coal per year in power stations and gas works up to 1970. The Government requested authority from Parliament to absorb the cost involved up to a limit of 45 million pounds sterling ($108 million).

Coal.—Production declined another 1 percent and consumption fell about 8 percent in continuation of the long-term trend toward contraction of the coal industry. A number of gains were nevertheless achieved by the National Coal Board in 1967. The industry's activities were marked by an upsurge in productivity, further progress in mine mechanization, and a substantial improvement in tonnage lost due to industrial disputes.

Average output per manshift through the year was 5 percent higher than 1966. The chief reasons for the gain in productivity were increased mechanization and the concentration of output in the most productive units. The proportion of power-loaded coal went up from 85 percent in 1966 to 90 percent in December 1967. More than 57 percent of coal faces were equipped with power-operated, self-advancing supports at yearend, and 450 machines were producing coal on a 24-hour basis compared with 382 in 1966. The number of coal faces was reduced from 1,749 in 1966 to 1,580 in 1967, concentrating output in the more productive units. The average daily pithead output per face rose to 516 tons from 472 tons in 1966.

The average number of men employed declined from 426,800 in 1966 to 401,000 in 1967, the number at yearend being 382,400. During the year 27 colleries were closed, compared with 61 in 1966, in accordance with the policy of the National Coal Board to shut down depleted and uneconomic pits. The closing of 16 colleries planned for the December quarter was postponed at the request of the Government.

Coal sales totaled nearly 166 million tons, 14 million tons below the 1966 figure, and undistributed stocks rose to the highest level in 7 years. Decreased demand was attributed to increased use of competitive fuels, mild weather in the early months of 1967, the low level of general economic activity, and the continued conversion of the railways to diesel and electric traction which has eliminated British Rail as a major coal user.

Natural Gas.—The first natural gas to reach Britain from North Sea fields was brought ashore in March 1967, some 18 months from the date of the first commercial discovery of gas in the United Kingdom's Continental Shelf. The gas came from the West Sole field of British Petroleum, Ltd., via a new 73-kilometer 16-inch pipeline to the shore terminal at Easington (near Hull). Deliveries at the initial rate of 50 million cubic feet daily began in July. Yearend over 16 billion cubic feet of gas had been delivered.

The announced objective of the British Government is that North Sea gas should be brought rapidly into use to enable the country to benefit as soon as possible from this indigenous primary fuel. Recoverable reserves in the four important gasfields discovered since drilling began on the Dogger Bank in December 1964, were estimated by the Ministry of Power at 25 trillion cubic feet. This quantity is estimated to be sufficient to replace manufactured (town) gas completely in the course of a few years and to bring about a major expansion of

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the market for gas. Reserves are sufficient to build up to a production rate of some 3,000 million cubic feet per day (MMcfd) within 5 or 6 years, equivalent to about 3 times present consumption of town gas. It is assumed for planning purposes that additional reserves will be discovered through continuing exploration in the Continental Shelf and that production could reach 4,000 MMcfd in 1975. The Gas Council is accordingly planning a phased program of conversion of the town gas system to direct natural gas supply. The cost of converting the estimated 30 million appliances of Britain's 13 million gas consumers over 10 years is estimated at 400 million pounds sterling ($960 million).

While the 4,000 MMcfd expected to be available in 1975 will represent 15 percent of the estimated demand for all energy, its rapid absorption will not cause dislocation to the energy market, in the view of the Ministry of Power. It will, however, result in considerable changes in the gas industry involving the wholesale displacement of much of the existing gas manufacturing facilities and methods, a national conversion program, and a nearly fourfold expansion of sales by 1975.

Work progressed during 1967 on a distribution network to supply natural gas to all areas of the United Kingdom by 1970. The system is designed for a working pressure of 1,000 pounds per square inch. During the year a 24-inch feeder main, running 140 kilometers from the Easington terminal connecting the West Sole field with the national grid at Totley (near Sheffield), was completed and work was begun on a 36-inch feeder main to carry gas supplies 197 kilometers from the reception terminal, being built at Bacton, Norfolk, to the national system just south of Rugby. A 30-inch undersea pipeline connecting the Leman Bank field, shared by the Shell/Esso and Gas Council/Amoco groups, with Bacton 54 kilometers away, was completed in 1967. The net increase in total pipeline mileage in the year ended March 31, 1967, was 4,958 kilometers.

Total gas sales in the 1966–67 year ended March 31 rose an average 7.7 percent. Taking into account the plus 0.4°C temperature rise over the 1965–66 level, the demand was estimated to have grown by 9 percent. Of total sales amounting to 3,775 million therms (1 therm equals 100,000 Btu's), 60 percent went to domestic, 24 percent to industry, and 14 percent to commercial consumers, with the remaining 2 percent going to public bodies and for the use of the Gas Boards. In recent years the old methods of making gas from coal have been rapidly superseded by oil-reforming processes at important savings in cost. While coal-based and oil-based gas were produced in equal quantities in 1966–67, future plans call for production of about two-thirds from oil and one-third from coal. About 10 percent of Britain's gas supplies was imported from Algeria in the form of liquefied natural gas under a 15-year contract negotiated in 1964. Natural gas from the North Sea reached the mainland too late to make any significant contribution to 1966–67 supplies.

Petroleum.—Inland consumption of oil products rose by 7.7 percent over that of 1966, a rate somewhat less than the 9.5-percent average gain over the previous 3 years. The increase was registered during a year of economic restraint and despite major supply dislocations and higher oil prices caused by the Arab-Israeli conflict, the interruption of shipments from Iraq earlier in the year, and the suspension of exports from Nigeria. These supply problems and the closure of the Suez Canal resulted in greatly increased imports from the Western Hemisphere and Iran, and in extensive rerouting of tankers, but they were met with a minimum of inconvience to consumers. No serious shortages occured, and the contingency powers given to the Government by Parliament to introduce rationing of liquid fuels if necessary were not used.

At the close of 1967 the annual capacity of the United Kingdom's 19 oil refineries was about 84 million tons. Construction of new refineries and additions to existing plants were expected to raise the total to about 116 million tons by 1970. Refinery output of a little over 73.5 million tons in 1967 reached a new high, exceeding the 1966 figure by 2.5 percent. Refinery output in 1967 was affected by the substantial supply and shipping dislocations and the drawdown of oil stocks.

At the close of 1967, seven new refineries with a total capacity of 24 million tons per year were either planned or under

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construction, while additions to existing refinery capacity of 7.25 million tons were being installed. Status of these refineries was as follows:

Company	Location	Capacity (metric tons per year)	Status
New plants:			
Shell U.K. Ltd.	Teesport	6,000,000	Completion early 1968.
Lindsey Oil Refining Ltd.	Killingholm	6,000,000	Completion spring 1968
Gulf Oil Refining Ltd.	Milford Haven	3,000,000	Completion mid-1698.
United Refineries, Ltd.	Canvey Island	2,000,000	Planned.
Continental Oil (U.K.) Ltd.	Killingholm	4,500,000	Completion second half 1968.
Isle of Man Petroleums, Ltd. (Natomas)	Isle of Man	500,000	Completion 1969.
Murco Petroleum Ltd.	Glasgow	2,000,000	Do.
Additions to existing capacity:			
British Petroleum, Ltd.	Grangemouth	2,500,000	Late 1968.
Mobile Oil, Ltd.	Coryton	3,800,000	1969.
Burmah Oil Co., Ltd.	Ellesmere Port	950,000	Mid-1969.

The first stage of construction of the 398–kilometer, 8- to 14-inch, light products pipeline from the Thames estuary to the Mersey River was completed during the year by United Kingdom Oil Pipelines, Ltd., a group of oil companies. The central section of the line is planned for construction in 1968. The pipeline will be Britain's first big products pipeline, and when completed, it will have an initial daily capacity of about 60,000 barrels, which will later be raised to 120,000 barrels per day.

Shell completed a 109–kilometer 12–inch pipeline to transport crude from Stanlow to the company's refinery at Heysham.

A group of three oil companies, Regent, Gulf, and Esso, was planning to construct a 403–kilometer products pipeline from Milford Haven (Wales) to the Midlands and Manchester. Official permission was requested to proceed with the 288–kilometer section from Milford Haven to the Midlands. The diameter of the pipe will probably be between 16 and 20 inches. The estimated cost was 10 to 15 million pounds sterling ($24 to $36 million).

British Petroleum, Ltd., was authorized by the Ministry of Power to replace its existing 12–inch, 91–kilometer crude pipeline from Finnart to Grangemouth with a new 20–inch line required by the expansion of refinery capacity at Grangemouth.

Esso planned to lay a fuel oil pipeline between its refinery at Fawley and West London, parrallel to the existing white products and liquefied petroleum gas lines. The 10-inch line would be designed for flow rates up to about 1 million gallons per day (over 1.5 million tons per year). The project, including expansion of storage capacity at West London, would cost about 4 million pounds ($9.6 million).

Crude oil production increased slightly, but still made no significant contribution to the country's requirements. Drilling on the North Sea Continental Shelf had not yielded commercial quantities of oil through yearend 1967. There appears to be greater likelihood that oil may be found in the northern areas of the United Kingdom's Continental Shelf, off the coast of Scotland where little drilling has so far taken place.

As the result of the devaluation of the pound sterling by 14.3 percent in 1967, the Ministry of Power at yearend permitted the prices of basic oil products to be raised on the average by 1 penny (1 U.S. cent per gallon). Prices in general remained unchanged because the Government simultaneously cut from 2 pence to 1 the temporary surcharge on oil products that was introduced in mid-1967 because of the Middle East crisis.

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The Mineral Industry of Venezuela

By Gordon W. Koelling [1]

Measured in terms of gross receipts from sales, the value of Venezuelan mineral production increased more than 4 percent in 1967 as compared with an approximate 3-percent decline during 1966. An upsurge in crude oil output was largely responsible for the recovery. Mineral production accounted for over 30 percent of the country's estimated gross national product (GNP) of US$8,560 million [2] (at current prices). The mineral industry also provided almost 70 percent of Government revenue and over 95 percent of foreign exchange earnings.

The petroleum (including natural gas) industry accounted for 95 percent of the value of the country's 1967 mineral production as measured in terms of gross receipts from sales. Venezuela retained third place among the world's crude oil producing nations behind the United States and the U.S.S.R. It also remained the world's leading petroleum exporting country, accounting for 19 percent of total world oil shipments.

The 5-percent increase in the country's crude oil output during 1967 resulted primarily from the Middle East crisis which disrupted world oil supply patterns to Venezuela's advantage. Other contributing factors were the resolution of back-tax claims and the establishment of firm tax criteria for the future. However, to a large extent, these factors only served to postpone some of the petroleum industry's basic problems. Reserves of crude oil and natural gas declined during 1967, costs of production remained high in comparison with those in other major petroleum exporting countries, and the lower transportation costs made possible by the increased use of supertankers further eroded the advantage of Venezuela's geographic proximity to consumers in the Western Hemisphere. New antipollution regulations severely limited the allowable sulfur content of fuels used in the Eastern United States, the principal market for Venezuelan residual fuel oil.

Iron ore accounted for almost all of Venezuela's nonpetroleum minerals output in 1967.

Although the Venezuelan Government reaffirmed the longstanding policy against granting new petroleum concessions, the country's oil law was amended in July 1967 to permit service contract arrangements. This amendment specifies that Corporación Venezolano del Petróleo (C.V.P.), the national oil entity, may enter into contracts or form mixed enterprises with private oil companies provided the terms and conditions of each contract are more advantageous to Venezuela than those of the concessions currently in force. The bases for service contracts, including the maximum area to be included in the contracts and other matters related to the characteristics of the areas, are to be approved by the Congress. Contracts normally are to have a duration of 20 years after the start of commercial production, preceded by a 5-year exploration period. In special cases, with prior approval of the Congress, contracts may have a duration of up to 30 years from the date of signature.

Another important item of petroleum legislation enacted during 1967 was the Law Governing Desulfurization of Hydrocarbons. This law authorizes the Government to enter into special agreements on reference values (values on which taxes are paid) for residual fuel oil exported from Venezuela and for Venezuelan crudes which are processed and desulfurized in the usual refineries in the Caribbean area. However, such an agreement is permitted

[1] Geographer, Division of International Activities.

[2] Where necessary, values have been converted from bolívares (Bs) to U.S. dollars at the rate of Bs4.50=US$1.

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only when the producer assumes the obligation of installation in Venezuela of desulfurization facilities capable of reducing the sulfur content of a reasonable part of its residual fuel oil production in accordance with market requirements.

PRODUCTION

Although the value of Venezuela's total mineral output increased by more than 4 percent during 1967, performance of the various sectors of the mineral industry was mixed. Production of such major items as crude oil, natural gas, iron and steel, and gold rose significantly, as did the output of some of the country's other mineral commodities. However, the production of iron ore was down slightly, and the output of diamonds and salt declined sharply.

Aluminum was produced for the first time during 1967.

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Table 1.—Venezuela: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967 [p]
Metals:					
Aluminum					3,090
Gold, troy ounces	26,947	33,536	23,660	r 16,895	r 19,997
Iron and steel:					
Iron ore, thousand tons	11,747	15,656	17,510	17,759	r 17,005
Pig iron, do	302	323	334	351	422
Steel ingots and castings, do	364	440	r 625	r 537	r 667
Semimanufactures, do	159	399	347	341	420
Nonmetals:					
Cement, do	1,580	1,850	2,112	2,114	2,248
Diamond:					
Gem, carats	38,400	57,467	52,313	41,796	38,218
Industrial, do	27,597	48,816	28,767	31,229	23,538
Bort, do	3,676	9,321	9,877	11,674	7,871
Total, do	69,673	115,604	90,957	84,699	69,627
Gypsum [e]	r 65,300	r 74,800	r 85,900	86,000	NA
Lime	50,143	67,609	r 64,281	r 44,436	NA
Limestone:					
For cement [e]	2,028,000	2,462,000	2,655,000	2,750,000	2,890,000
For lime, agriculture, and construction [e]	90,000	121,000	114,000	NA	NA
Total [e]	2,118,000	2,583,000	2,769,000	NA	NA
Nitrogenous fertilizers, manufactured [2]	52,891	132,847	94,754	114,908	135,245
Phosphate rock			e 6,000	NA	30,000
Salt, thousand tons	76	203	172	r 149	e 85
Mineral fuels:					
Coal, bituminous	r 42,347	r 36,250	r 29,939	r 34,215	34,458
Carbon black	4,536	6,128	6,804	r 7,350	7,350
Gas, natural:					
Usable production:					
Sold, million cubic feet	r 79,422	r 90,299	r 95,455	r 102,377	119,328
Producers' fuel, do	r 118,692	r 127,662	r 135,431	r 139,739	145,884
Shrinkage due to extraction of natural gas liquids, do	r 19,705	r 19,458	r 18,929	r 21,789	27,439
Field injection, do	r 574,496	r 598,228	r 625,773	r 652,435	700,640
Subtotal, do	r 792,315	r 835,647	r 875,588	r 916,340	993,291
Flared or otherwise lost, do	r 530,742	r 551,153	r 566,868	r 541,230	622,701
Total, do	r 1,323,057	r 1,386,800	r 1,442,456	r 1,457,570	1,615,992
Natural gas liquids:					
Natural gasoline, thousand 42-gallon barrels	r 2,308	r 2,935	r 3,186	r 3,143	3,334

See footnotes at end of table.

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Table 1.—Venezuela: Production of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity [1]		1963	1964	1965	1966	1967 [p]
Mineral fuels—Continued						
Condensate	thousand 42-gallon barrels	1,083	1,754	1,909	1,540	1,896
Liquefied petroleum gases	do	5,088	[r] 5,823	[r] 6,004	[r] 6,637	7,462
Total	do	[r] 8,479	[r] 10,512	[r] 11,099	[r] 11,320	12,692
Petroleum:						
Crude	do	1,185,511	1,241,782	1,267,602	1,230,464	1,292,876
Refinery products:						
Gasoline and naphthas	do	50,795	45,014	47,428	50,662	50,244
Jet fuel	do	(3)	13,678	15,805	20,451	26,183
Kerosine	do	8,849	9,880	7,961	6,069	5,042
Distillate fuel oil	do	79,614	77,708	71,071	70,799	67,642
Residual fuel oil	do	214,573	233,951	268,080	260,617	255,991
Lubricants	do	4,402	4,638	3,721	3,746	3,788
Refinery gas [4]	do	4,607	4,522	6,006	6,642	5,692
Asphalt	do	5,275	5,443	5,171	4,948	5,477
Other	do	12,663	5,786	3,528	4,946	4,872
Total	do	380,778	400,620	428,771	428,880	424,931

[e] Estimate. [p] Preliminary. [r] Revised. NA Not available.
[1] In addition to reported commodities, Venezuela is known to produce sand, gravel, and clay, but data are not available on the output of these items.
[2] Sales.
[3] Not reported separately, included with "Other".
[4] Liquid equivalent.

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TRADE

Exports of mineral commodities played a dominant role in Venezuela's overall foreign trade picture during 1965 and 1966, the latest years for which complete trade information is available. Data on the value of the country's mineral commodities trade, as compared with total trade, were as follows:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	2,852	2,895	98.5
1966	2,809	2,861	98.2
Imports:			
1965	126	1,267	9.9
1966	103	1,165	8.8
Trade balance:			
1965	2,726	1,628	XX
1966	2,706	1,695	XX

XX Not applicable.

Source: Republica de Venezuela. Ministerio de Fomento. Dirección General de Estadística y Censos Nacionales, Boletin de Comercio Exterior, 1965 and 1966.

Petroleum accounted for about 95 percent of the value of all minerals exported during these years. The United States was the principal destination of direct petroleum shipments, followed by the Netherlands Antilles. However, almost all of the petroleum exports to the latter area consisted of crude oil and unfinished oils destined for processing at two large refineries owned by the parent companies of Creole Petroleum Corp. and Cía. Shell de Venezuela, Ltd., Venezuela's first and second ranking crude oil producers. These refineries export their output and are, in a sense, an integral part of Venezuela's petroleum industry.

Exports of Venezuelan petroleum from Venezuela and the Netherlands Antilles by principal areas of destination for years 1965–67 were as follows:

Destination	Exports (thousand 42-gallon barrels)		
	1965	1966	1967
Western Hemisphere:			
Canada	128,497	105,362	142,989
Puerto Rico	47,530	55,202	56,281
Trinidad and Tobago	48,151	55,022	67,046
United States	496,288	512,485	502,468
Other	136,807	137,074	131,503
Total	857,273	865,145	900,287
Eastern Hemisphere:			
Western Europe:			
European Economic Community	81,483	76,371	98,748
Spain	21,335	20,453	29,369
United Kingdom	106,641	84,454	80,098
Other	51,837	45,888	39,436
Subtotal	261,296	227,166	247,651
Other	38,439	42,221	50,635
Total	299,735	269,387	298,286
Grand total	1,157,008	1,134,532	1,198,573

Source: Republic of Venezuela. Ministry of Mines and Hydrocarbons, Office of Petroleum Economics. Venezuelan Petroleum Industry, Statistical Data, 1967.

The preceding data reflect some of the disruptions in the world supply pattern resulting from the Middle East crisis. Venezuelan petroleum exports to Western Europe and Canada, which had been declining in the face of competition from Middle Eastern and North African producers, increased by more than 17 percent during 1967 while total petroleum exports rose only about 6 percent.

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Table 2.—Venezuela: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum, all forms	11	840	Mainly to United States.
Copper, all forms	(1)	726	Netherlands 433; Japan 266.
Iron and steel:			
Iron ore—thousand tons	17,006	17,037	Mainly to United States.
Cast iron	50	-------	
Steel ingots and equivalent primary forms	60,880	33,802	Argentina 13,006; Colombia 10,199; Peru 10,121.
Sheets and plates	7	568	Mainly to United States.
Seamless tubes	6,282	12,896	United States 8,861; Colombia 1,933; Trinidad and Tobago 1,263.
Zinc and alloys	NA	1	All to Colombia.
Other metals, unwrought and semimanufactures, not further described	2,418	-------	
Nonmetals:			
Cement, white	243,128	163,094	Peru 54,243; Surinam 33,512; Martinique 18,961.
Diamond—carats	r 120,000	-------	
Fertilizers:			
Nitrogenous	-------	4,967	Nicaragua 3,528; Costa Rica 1,434.
Potassic	-------	5	All to Colombia.
Gypsum, crude and calcined	1,202	2,201	Mainly to Trinidad and Tobago.
Lime	9	8	All to Netherlands Antilles.
Magnesite	-------	1,001	Mainly to Canada.
Salt	20,762	-------	
Sand	-------	21	All to Colombia.
Stone, dimension	117	535	Mainly to Netherlands Antilles.
Other nonmetals	r 11	509	Mainly to Netherlands.
Mineral fuels:			
Carbon black	561	11,852	United Kingdom 8,101; Brazil 3,137.
Coal	11	70	All to Colombia.
Natural gas liquids:			
Natural gasoline—thousand 42-gallon barrels	2,816	2,563	Netherlands Antilles 1,150; United States 1,147.
Liquefied petroleum gases—do	1,802	3,312	Brazil 1,809; Argentina 1,473.
Petroleum:			
Crude—do	851,092	826,072	Netherlands Antilles 271,130; United States 169,519; Canada 61,681.
Refinery products:			
Gasoline—do	22,063	23,710	United States 7,597; Puerto Rico 5,898; United Kingdom 4,130.
Kerosine—do	1,247	550	Mainly to Netherlands Antilles.
Distillate fuel oil—do	45,327	44,947	Canada 9,294; Netherlands 7,408; Sweden 6,503; United States 5,737.
Residual fuel oil—do	244,049	238,687	Mainly to United States.
Lubricants—do	2,979	3,148	United Kingdom 1,493; Sweden 636.
Asphalt—do	3,261	3,141	Mainly to United States.
Other—do	17,176	21,060	United States 12,752; Brazil 1,870; Malaysia 1,860.

[1] Less than ½ unit. r Revised. NA Not available.

Source: Dirección General de Estadística y Censos Nacionales, Ministerio de Fomento, Boletin de Comercio Exterior, 1965 and 1966. Venezuela. Memoria y Cuenta, Año 1966 y 1967. Caracas, Venezuela, March 1967 and 1968.

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Table 3.—Venezuela: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys:			
Unwrought	2,968	1,755	Mainly from United States.
Semimanufactures	4,762	6,355	United Kingdom 2,640; United States 1,744.
Antimony, all forms	r 30	38	Mainly from United States.
Chromite	1,263	2,334	All from United States.
Copper and alloys:			
Unwrought	127	63	Mainly from United States.
Semimanufactures	6,440	7,891	Chile 4,052; United States 1,261.
Iron and steel:			
Iron ore and concentrate	-------	3	All from United States.
Scrap	5,874	23,776	Mainly from United States.
Pig iron	1,283	164	Mainly from Japan.
Ferroalloys	9,082	5,944	France 3,075; Norway 828; Brazil 787.
Steel ingots and equivalent forms	2,007	3,068	United States 753; West Germany 603; United Kingdom 526.
Semimanufactures:			
Bars, rods, and structural sections	97,053	41,009	Belgium-Luxembourg 19,328; West Germany 18,434.
Plates and sheets:			
Uncoated	145,142	146,610	Japan 77,495; Belgium-Luxembourg 21,488.
Coated:			
Tinplate	71,190	51,150	France 19,548; Japan 18,234; United States 7,666.
Galvanized and other	30,549	14,025	United States 5,375; Belgium-Luxembourg 4,746; Canada 3,294.
Hoop and strip	r 4,247	3,718	Belgium-Luxembourg 1,464; United States 929.
Wire	53,318	36,677	West Germany 11,758; Belgium-Luxembourg 9,682; Japan 7,438.
Pipes and fittings	96,068	74,495	United States 26,831; West Germany 17,475; France 13,802.
Rails and accessories	1,634	4,665	Mainly from United States.
Other	2,171	1,283	United States 484; Japan 325.
Lead and alloys:			
Unwrought	1,693	4,422	Mexico 1,697; United States 1,676.
Semimanufactures	498	722	United States 240; United Kingdom 142; Australia 115.
Mercury 76-pound flasks	116	151	Mexico 75; United States 36.
Nickel and alloys, all forms	94	91	United States 45; Canada 34.
Platinum-group metals and their alloys, unworked and semimanufactured. troy ounces	3,697	3,054	West Germany 1,543; United States 804.
Silver and alloys:			
Unwrought do	88,672	59,832	West Germany 25,142; United States 19,644.
Semimanufactures do	185,445	78,544	United States 41,860; West Germany 28,711.
Tin and alloys:			
Unwrought long tons	r 183	225	Mainly from United Kingdom.
Semimanufactures do	r 9	12	Belgium-Luxembourg 6; United Kingdom 2.
Zinc and alloys:			
Unwrought	4,072	5,342	Australia 1,617; Belgium-Luxembourg 1,251; United States 644.
Semimanufactures	1,087	836	Mainly from United States.
Nonferrous metals, not otherwise described:			
Ores, concentrates, and scrap	1,324	1,894	Spain 991; Norway 500; United States 229.

See footnotes at end of table.

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Table 3.—Venezuela: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Nonferrous metals, not otherwise described—Continued			
Metal and alloys:			
Unwrought	30	124	Mainly from United States.
Semimanufactures, other	r 36	114	Do.
Nonmetals:			
Abrasives	168	201	Mainly from West Germany.
Asbestos, crude, washed, ground	4,316	5,317	Mainly from Canada.
Barite	17,399	12,201	Mainly from Brazil.
Borates	1,930	1,109	Belgium-Luxembourg 497; United Kingdom 363.
Clays:			
Bentonite	3,746	3,517	Mainly from United States.
China clay (kaolin)	5,430	5,655	United States 3,652; United Kingdom 1,852.
Fire clay	4,853	5,357	Guyana 2,650; Peru 1,300.
Cryolite	4	7	West Germany 5; United Kingdom 2.
Diamond, industrial [1] thousand carats	280	1,995	Mainly from United States.
Diatomaceous earth	1,990	2,118	United States 1,813; Mexico 214.
Feldspar	7,953	8,533	United States 4,989; Canada 3,544.
Fertilizer materials:			
Nitrogenous	6,006	10,003	Trinidad and Tobago 7,215; Barbados 2,785.
Phosphatic	302	5,329	Mainly from United States.
Potassic	24,885	15,842	United States 5,650; West Germany 5,150; Italy 5,025.
Mixed	12,569	62	Mainly from West Germany.
Fluorspar	167	3,804	Mainly from Mexico.
Fuller's earth	928	810	United States 613; United Kingdom 121.
Graphite	299	533	United States 393; United Kingdom 133.
Gypsum, crude and calcined	83	126	Mainly from United States.
Magnesite	2,180	2,914	United States 1,760; Netherlands 513; Italy 500.
Mica	384	392	Mainly from United States.
Refractory earths and rocks, not further described	7,853	5,712	Do.
Salt	------	406	All from United States.
Sand	4,278	2,875	United States 1,592; Belgium-Luxembourg 1,208.
Stone, industrial, not further described	31,102	24,514	All from United States.
Sulfur:			
Unrefined	33,159	2,825	United States 1,529; Netherlands Antilles 1,285.
Refined	701	681	United States 436; Belgium-Luxembourg 140.
Talc	3,001	2,983	United States 1,274; Italy 1,268.
Vermiculite	499	453	Republic of South Africa 261; United States 179.
Mineral fuels:			
Bitumen, natural	164	87	Mainly from United States.
Carbon black	885	745	United States 546; Canada 179.
Coal	10,089	3,872	Mainly from United States.
Coke	193,558	156,327	West Germany 72,280; United States 56,166; Norway 12,814.
Coal and coke briquets	69	31	United States 23; Colombia 8.
Petroleum refinery products:			
Gasoline, kerosine, and distillate fuel oil 42-gallon barrels	958	1,233	Mainly from Netherlands.
Gasoline additives	3,684	4,454	United States 2,683; United Kingdom 1,771.

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Lubricants	42-gallon barrels	39,319	27,482	Mainly from United States.
Solvents	do	9,399	11,802	Do.
Paraffin and wax		5,126	2,658	Do.
Vaseline and other petroleum jellies		1,110	1,002	Do.
Asphalt		1,542	1,098	Do.
Other		1,215	2,913	Do.

r Revised.
1 Approximate, based on data reported in kilograms.

Source: Direccion General de Estadistica y Censos Nacionales, Ministerio de Fomento. Boletin de Comercio Exterior, 1965 and 1966. Venezuela.

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COMMODITY REVIEW

METALS

Aluminum.—Venezuela's first aluminum reduction and fabricating plant, located at Matanzas just outside of Puerto Ordaz, was dedicated in October 1967. This plant is operated by Aluminio del Caroni, S.A., owned jointly by Reynolds Metals Co. and Corporación Venezolana de Guayana (C.V.G.), a Venezuelan Government entity. The plant, valued at $22.5 million, has an annual capacity of 10,000 tons of ingots, billets, sheet, coils, industrial sheet, and aluminum circles. Plans have been announced to increase this capacity to 22,500 tons annually by the end of 1969. Alumina and carbon anodes are obtained from Reynolds plants in the United States, and electric power is supplied by the hydroelectric plant at Macagua Dam.

Iron and Steel.—Venezuela's output of iron ore declined more than 4 percent during 1967 as a result of increased competition in world export markets. The production of Orinoco Mining Co., a subsidiary of United States Steel Corp., totaled about 14.2 million tons, and the output of Iron Mines Co. of Venezuela, a subsidiary of Bethlehem Steel Corp., was 2.9 million tons. Siderúrgica del Orinoco, S.A. (SIDOR), a subsidiary of the Government-owned C.V.G., began mining small quantities of iron ore from the San Isidro deposits in the Sierra Imataca during the latter part of the year. Venezuela's total estimated iron ore reserves remained at about 3 to 4 billion tons of at least 58 percent iron content.

All but approximately 700,000 tons of Venezuela's 1967 iron ore output was exported. Almost all domestic consumption was accounted for by SIDOR which obtained most of its ore supply from Orinoco Mining.

At yearend 1967, Orinoco Mining signed a contract with the Government for the construction and operation of a 1-million-ton-per-year iron ore processing plant at Puerto Ordaz. This plant will use a natural gas reduction process to upgrade ore from an average 58 percent iron content to 85 percent. The beneficiated ore will be briquetted for export to the United States. The Venezuelan Government has the option of acquiring a 25 percent interest in the plant during its first 2 years of operations. Construction is to begin about mid-1968 with completion scheduled for 1970.

The output of pig iron and crude steel (ingots and castings), all of which was produced by SIDOR, rose 20 and 24 percent, respectively, during 1967. SIDOR also accounted for most of the country's output of steel semimanufactures with the remainder being produced by Siderúrgica Venezolana, S.A. (SIVENSA), a private company.

A contract was signed in 1967 between SIDOR and Compagnie de Pont-a-Mousson of France for the construction of a $6 million plant for the manufacture of cast iron soil pipe. The plant, to be installed at SIDOR's Ciudad Guayana steel mill, will have an annual capacity of 30,000 tons of 60- to 300-millimeter-diameter pipe. Completion of this project is scheduled for late 1969.

SIDOR solicited bids, in late 1967, for the supply, installation, and preliminary operation of the equipment for its planned expansion into flat products manufacture. The interrelated projects for which bids were solicited included an oxygen-producing plant, ingot heating furnace, a hot scarfing machine, an electrolytic tinning line, and a plant to produce flat-rolled steel.

Nickel.—In July 1967, the Government contracted with Société Le Nickel, a French company, for a study of the feasibility of developing the nickel deposits at Loma de Hierro in the State of Aragua. This study is scheduled for completion during the third quarter of 1968. The contract further specified that the Venezuelan Congress would have to approve any agreement covering the exploitation of these deposits. Reserves of ore at Loma de Hierro have been calculated at over 40 million tons of 1.58 percent nickel content.

Uranium.—A uranium deposit which also contained thorium compounds was discovered during 1967 in the southeast corner of Bolívar State near the border with Brazil. According to the Venezuelan Institute of Scientific Investigation, the commercial value of the deposit, in a quartz basement rock, is unknown with preliminary assays indicating 0.3 to 0.5 percent U_3O_8.

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NONMETALS

Fertilizer Materials.—Instituto Venezolano de Petroquímica (I.V.P.), the Government-owned petrochemical company, awarded a contract for the expansion of its chemical fertilizer facilities at Morón, which had an annual capacity of 120,000 tons at yearend. The new facilities will raise Morón's ammonia output capacity to 200,000 tons annually as a first step in the plan to increase the plant's total fertilizer output to 720,000 tons per year. Actual work on the project is to begin sometime in 1968, and completion is scheduled for 1969.

During 1967, I.V.P. signed two partnership agreements involving the construction and operation of chemical fertilizer plants which are to be a part of a planned petrochemicals complex at El Tablazo near Lake Maracaibo. The first of these agreements was with Petroquímica del Atlántico of Colombia and International Development Investment, a U.S. and European consortium. This joint venture, which will operate under the name of Venezolana de Nitrógeno (Nitroven), involves the construction of a plant which will have a capacity to produce approximately 500,000 tons of urea annually and will be one of the world's largest facilities for the production of this commodity. The second agreement, with Commonwealth Refining Co. (CORCO) of Puerto Rico, calls for the construction of a 330,000-ton-per-year ammonia facility. Feedstock for both plants will be natural gas piped from oilfields in Lake Maracaibo. Completion of both plants is expected by 1969 or 1970.

Negotiations were in progress on plans to construct a 500,000-ton-per-year ammonia plant at Bajo Grande, on the western shore of Lake Maracaibo. Venezuelan Sun Oil Co. would be the operator for itself and four other participants: I.V.P., Venezuelan Atlantic Refining Co., Texaco Maracaibo, Inc., and Texaco Seaboard, Inc. The plant, which would be completed in 1970, would be of single train design and would use natural gas from Lake Maracaibo oilfields for its feedstock.

Plans for at least one other chemical fertilizer plant were being considered at yearend 1967. This project would involve a consortium consisting of I.V.P., Colombian, and Dutch interests and would be the first concrete result of a petrochemical integration agreement signed by Venezuela and Colombia. The plant was originally planned for Barranquilla, Colombia, but a reevaluation of the quantities of natural gas available for feedstock from the nearby El Difícil gasfield revealed a much smaller potential than initially estimated.

Most of the production from Venezuela's planned additional chemical fertilizer capacity would be for export, primarily to markets in the Western Hemisphere. Consequently, the expansion of similar facilities elsewhere in the Hemisphere could delay or even cause the cancellation of one or more of Venezuela's fertilizer projects.

Magnesite.—A survey made by the Ministry of Mines and Hydrocarbons in cooperation with the Venezuelan Development Corp. and the owners of the Loma de Guerra magnesite properties on Margarita Island off Venezuela's northern coast was completed during 1967. Results of this survey indicated recoverable reserves at 5 million tons of raw magnesium carbonate. A Canadian firm, Prospection, Ltd., was given a contract to determine the feasibility of mining these deposits.

MINERAL FUELS

Coal.—Coal output increased slightly but remained well under the production peak recorded in 1963. The State of Táchira continued to be the source of almost all output, and C.A. Minas de Carbón de Lobatera was the principal producing company.

A Government commission, appointed to resolve the question of activating the C.V.G. coal mines at Naricual, published its findings at the end of 1967. This report concluded that it was economically justifiable to utilize Naricual coal in the production of coke for use by Venezuela's iron and steel industry. It recommended that the mines be reactivated, that a coking plant be built, and that the responsibility for the mines be taken from C.V.G. and assigned to a government entity not involved in the manufacture of iron and steel.

Petroleum and Natural Gas.—After a decline of almost 3 percent during 1966, Venezuela's crude oil production rose 5 percent to 3,542,000 barrels per day in 1967. Companies owned by U.S. firms produced approximately 73 percent of the total 1967 output with Creole Petroleum Corp., a subsidiary of Standard Oil Co.

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(New Jersey), alone accounting for 39 percent.

The output of natural gas continued to rise, increasing about 11 percent to 4,427 million cubic feet per day during 1967. Most of the natural gas produced was from oilfields. Output of natural gas liquids increased by 1,372,000 barrels during the year.

In contrast to increased production, proved reserves of crude oil declined 937 million barrels to a reported total of 15,932 million barrels at yearend 1967. Proved reserves of natural gas, as of the same date, totaled 27,833 billion cubic feet, 1,344 billion cubic feet less than at yearend 1966. These decreases were largely a reflection of the decline in exploratory activity. Geologic and geophysical exploration and exploratory, development, and injection drilling activities were as follows:

		1966	1967
Geologic and geophysical exploration:			
Geologic surveying	party months	5.8	4.2
Seismic surveying	do	8.3	5.6
Structural drilling	do	5.5	5.1
Total	do	19.6	14.9
Drilling:			
Wells drilled:			
Exploratory:			
Oil	number	58	45
Dry	do	32	31
Subtotal	do	90	76
Development:			
Oil	do	290	232
Dry	do	14	11
Subtotal	do	304	243
Injection	do	9	7
Total	do	403	326
Footage drilled	feet	617,024	746,046

Source: Ministerio de Minas e Hidrocarburos, Venezuela. Memoria y Cuenta, Año 1966 y 1967. Caracas, Venezuela, March 1967 and March 1968.

Seismic activity during 1967 included a survey of the Gulf of Venezuela. This survey, requiring 1.3 party months of fieldwork, was performed under contract to C.V.P. by Western Geophysical Co., a division of Litton Industries. Western Geophysical conducted the survey using two marine crews equipped with its new "aquapulse" offshore seismic system which utilizes a nonexplosive, impulse sound source in place of conventional explosive charges. Binary digital recorders were used to record all seismic data which were then sent to Western Geophysical's Houston, Texas, digital processing center. When computer processing is completed, C.V.P. will make the final data available to the 15 private companies which participated in financing the venture. These companies will make use of this information in formulating bids on service contracts covering exploration and production in the Gulf of Venezuela.

The capacity of gas injection facilities was increased by 254 million cubic feet daily to a total of 3,084 million cubic feet per day in 1967. Gas injection during the year was at an average rate of 1,984 cubic feet daily. Water injection capacity was raised 289,000 barrels per day to a total of 1,122,000 barrels daily by yearend 1967, and the average injection rate during the year was 800,300 barrels per day.

Refinery output averaged 1,164,000 barrels daily in 1967, down slightly from the previous year. However, refining capacity increased 125,300 barrels per day during 1967, mostly as a result of the expansion of existing refineries by Cía. Shell de Venezuela, Ltd., Creole Petroleum Corp., and C.V.P. The only new plant placed on stream was the small, 5,400-barrel-per-day Sinclair Venezuelan Oil Co. refinery at Barinas.

Under terms of an agreement negotiated with the Ministerio de Minas e Hidro-

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carburos, Creole is to invest $120 million in a residual fuel oil desulfurization project at its Amuay refinery in return for certain tax concessions such as the continuance of agreed reference prices for residual fuel oil through 1976 and accelerated depreciation of desulfurization facilities. Output capacity of these facilities is to be approximately 150,000 barrels per day of residual fuel oil with a maximum sulfur content of 1 percent by weight. Agreement had not been reached at yearend on terms of a plan for Shell to construct a 50,000-barrel-per-day residual fuel oil desulfurization plant at its Cardón refinery.

The total length of petroleum and natural gas pipelines in service was extended only 153 kilometers during 1967. Data on the length of pipelines in operation at yearend were as follows:

Type of line	Total length (kilometers)
Crude oil:	
Trunk	3,810
Secondary	2,807
Subtotal	6,117
Refined products	395
Natural gas	2,271
Total	8,783

Source: Ministerio de Minas e Hidrocarburos, Venezuela. Memoria y Cuenta, Año 1967, March 1968.

As a result of a gas supply contract signed at yearend 1967 between C.V.P. and Orinoco Mining Co., a 230-kilometer natural gas pipeline will be constructed between Anaco and Puerto Ordaz. This line will have a 20-inch diameter and a capacity of 150 million cubic feet per day.

The installation of facilities for cold-storage and ship-loading of liquefied petroleum gases at Shell's Puerto Miranda terminal on Lake Maracaibo was completed during 1967. This petroleum terminal, with a tanker-loading capacity of over 1 million barrels per day, is the largest in the Western Hemisphere. Liquefied petroleum gas facilities installed at Puerto Miranda included a butane and propane refrigeration system, two insulated storage tanks with a combined capacity of 112,000 barrels, and 1.6 kilometers of polyurethane-insulated pipeline connecting the tanks with the tanker-loading pier.

A mission from the Philadelphia, Pa. public gas service has been negotiating with C.V.P. regarding a scheme to liquefy Venezuelan natural gas for shipment to that city as a solution to the atmospheric pollution problem caused by the burning of high-sulfur residual fuel oil. It has been estimated that a plant to liquefy 500 million cubic feet of gas per day would cost $100 million, and the two tankers required for transport would cost $60 million.

Venezuelan Government planners continued to view the expansion of the petrochemicals industry as one of the chief means of achieving a more diversified economy, and construction was initiated or agreement reached on several petrochemicals projects in addition to those summarized previously under "Fertilizer Materials."

Construction was in progress during 1967 on the petrochemicals plant of Química Venoco at Guacara, near Valencia. Química Venoco is owned 55 percent by private Venezuelan investors and 15 percent each by Phillips Investment Corp., Inversiones Shell, and I.V.P. This plant is scheduled to begin operations in 1968 with a capacity to produce 15,000 tons annually of dodecylbenzene, a product used in processing detergents. Indications are that 65 percent of the plant's production would satisfy domestic demand for dodecylbenzene and that the remaining output would be exported.

In February 1967, a contract was signed between I.V.P. and Allied Chemical Corp. to form a petrochemical enterprise at Morón for the annual production of 15,000 tons of ammonium sulfate, 2,500 tons of hydrofluoric acid, and 3,000 tons of fluorinated hydrocarbons. Participation in this joint enterprise, which will operate under the name of Química Carabobo, C.A., was set at 50 percent for each company. Plans called for the plant to begin operating before the end of 1968. It was expected that 70 percent of the plant's production could be marketed domestically.

Late in 1967, I.V.P. announced that engineering work on the El Tablazo petrochemicals complex would begin during 1968, In this connection, bids were accepted by I.V.P. during 1967 for the construction of a plant to produce 150,000 tons annually of ethylene and 85,000 tons per year of propylene from natural gas. A

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contract signed between I.V.P. and the Union Carbide Corp. established Unicar Petroquímica, C. A., which is to construct a 50,000-ton-per-year polyethylene plant at El Tablazo. Also under consideration for location in this petrochemicals complex were a polyisoprene plant with an annual capacity of 30,000 tons and a 40,000-ton-per-year synthetic rubber factory. Ethylene and propylene produced by I.V.P. would serve as the principal feedstock for the polyethylene, polyisoprene, and synthetic rubber plants. None of the projects planned for El Tablazo, including the chemical fertilizer plants described previously, are scheduled to be completed before 1969 or 1970, and it is considered possible that completion dates for some of the plants might be even later.

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Table 4.—Venezuela: Distribution of landholdings, crude oil production, and refining capacity by companies, 1967

Company	Principal ownership or affiliation	Nationality of ownership	Concessions [1] and assignations [2] as of Dec. 31, 1967 (hectares)	Crude oil production (thousand 42-gallon barrels)	Refining capacity as of Dec. 31, 1967 (thousand 42-gallon barrels daily)
Private:					
Caracas Petroleum, S.A	Ultramar Co., Ltd	British	29,883	2,844	
Chevron Oil Co. of Venezuela	Standard Oil Co. of California	United States	135,157	22,278	62
Cía. Shell de Venezuela, Ltd	Royal Dutch/Shell Group	British/Dutch	400,416	343,720	414
Cía. Española de Petróleos, S.A	Cía. Española de Petróleos, S.A	Spanish	10,546		
Continental Oil Co. of Venezuela	Continental Oil Co	United States	797	5,876	
Coro Petroleum Co	Texaco, Inc	do	70,865	4,639	
Creole Petroleum Corp	Standard Oil Co. (New Jersey)	do	653,833	503,281	539
International Petroleum Co., Ltd	do	do	6,133		
King Mill Oil Co., C.A	King Mill Oil Co	do	4,970		
Mene Grande Oil Co., C.A	Gulf Oil Corp	do	600,227	156,543	
Mito Juan Concesionaria de Hidrocarburos	Venezuelan investors	Venezuelan	2,187		
Mobil Oil Co. of Venezuela	Socony Mobil Oil Co	United States	166,625	49,166	90
Pan American Venezuelan Oil Co	Standard Oil Co. (Indiana)	do	5,500		
Phillips Petroleum Co	Phillips Petroleum Co	do	50,059	26,562	4
Signal Oil and Gas of Venezuela	Signal Oil and Gas Co	do	7,892	4,555	
Sinclair Venezuelan Oil Co	Sinclair Oil Corp	do	166,647	27,208	43
Sociedad Anónima Petrolera Las Mercedes (PETMER)	Texaco, Inc. and Ultramar Co., Ltd.	United States/ British.	63,026	1,778	
Talón Petroleum Co., C.A	Kirby Petroleum Co	United States	60,167	1,369	
Texaco Maracaibo, Inc	Texaco, Inc	do	3,147	37,326	
Texas Petroleum Co	do	do	155,260	27,295	10
Venezuelan American Independent Oil Producers Association, Inc.	Atlantic Richfield Co., Sun Oil Co., and Texaco, Inc.	do	841		
Venezuelan Atlantic Refining Co	Atlantic Richfield Co	do	32,335	(3)	
Venezuelan Gulf Oil Co	Gulf Oil Corp	do			159
Venezuelan Sun Oil Co	Sun Oil Co	do	20,000	75,473	
Total private companies			2,646,513	1,289,913	1,321
Venezuelan Government: Corporación Venezolano de Petróleo (C.V.P.)			371,968	2,963	16
Grand total			3,018,481	1,292,876	1,337

[1] To private companies.
[2] To the Government.
[3] Less than ½ unit.

Source: Ministerio de Minas e Hidrocarburos, Venezuela. Memoria y Cuenta, Año 1967. Caracas, Venezuela, March 1968.

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The Mineral Industry of Yugoslavia

By Roman V. Sondermayer [1]

Yugoslavia in 1967 continued to be one of Europe's leading nonferrous metal producers in spite of a leveling off in its mineral production. The more important minerals produced were antimony, barite, bauxite, chromite, copper, feldspar, lead, magnesite, pyrite, silver, and zinc. Difficulties including electric power shortages, low productivity, mine closures, and management deficiencies slowed mineral industry growth to minimal levels.

The value of the country's mineral output remained the same as in the past, about $640 million. The mineral industry contributed about 9 percent to the gross national product (GNP) and employed about 232,000 persons or 6.7 percent of the total work force of the country in 1967. Although a significant exporter of minerals, Yugoslavia had a negative trade balance of $162.3 million in mineral commodities during 1966, the latest year for which trade data are available.

The impact on the nation and of its mineral industry of economic reforms adopted 2 years ago can be assessed only in broad terms. Under the influence of the reforms and implementing measures, the growth of demand and production slowed considerably. Industrial production did not increase and there is evidence of the accumulation of stocks of finished products. In spite of these facts, it appears that the overall economic effect has been positive. In the mineral industry, reforms stimulated higher productivity, the closing of uneconomic mines, the layoff of excess miners and reduced production as unprofitable operations were closed. The areas most affected were those that were artifically subsidized during the period of centralized planning, such as lignite mining. These can be considered as positive developments, but if the stagnation of mineral output levels continues and strict investment policy curtails development of new facilities, the consequences could be serious.

PRODUCTION

In Yugoslavia efforts to maintain or increase mineral output, tight investment policy and general economic difficulties of the country necessitated better utilization of existing facilities rather than construction of new plants. The closing of unprofitable mines and switching to opencast mining whenever possible was common. Mass production of ore in both underground and opencast mining was used on a larger scale than in 1966.

Petroleum production and refining, although modest by world standards, was generally performed by modern and efficient methods. All three primary methods of oil production (flowing, pumping, and gas lifting) were used and secondary recovery methods (repressuring and water flooding) were widely employed. Hydraulic fracturing and chemical methods for stimulating production became everyday practice. Equipment and plants in the petroleum industry were generally modern and operations highly automated. In other branches of the mineral industry, the level of automation and mechanization was not considered satisfactory.

[1] Foreign mineral specialist, Division of International Activities.

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Table 1.—Yugoslavia: Production of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Aluminum:					
Bauxite thousand tons	1,285	1,293	1,574	1,887	2,131
Alumina	82,055	87,912	95,424	95,299	e 96,000
Ingots	35,895	34,768	41,318	42,022	44,574
Semimanufactures [1]	43,020	46,716	52,999	57,281	55,679
Antimony:					
Ore	123,327	124,965	127,044	117,296	111,142
Concentrate	7,671	7,511	7,602	8,266	e 8,000
Regulus	2,661	2,729	2,768	2,645	2,297
Arsenic concentrate	920	2,025	1,541	----	----
Bismuth, metal	88	84	88	103	107
Cadmium e	40	41	41	41	150
Copper:					
Ore thousand tons	5,629	5,928	6,003	5,624	5,874
Metal content of ore	62,094	63,184	62,551	62,222	e 65,000
Concentrate	261,208	287,305	270,785	257,207	e 260,000
Smelter	50,779	51,716	56,919	r 71,341	e 73,000
Electrolytic	49,032	51,941	56,354	62,920	66,189
Semimanufactures [2]	44,915	52,145	48,962	55,906	59,796
Chromium:					
Chromite	93,770	88,358	79,851	54,211	47,162
Chromite concentrate	56,176	52,591	46,990	38,982	e 31,000
Gold troy ounces	83,656	106,773	103,911	84,942	e 86,000
Iron and steel:					
Iron ore thousand tons	2,297	2,307	2,504	2,493	2,580
Pig iron do	996	1,026	1,115	1,143	1,177
Ferroalloys do	64	50	60	74	79
Steel ingots do	1,588	1,677	1,769	1,867	1,832
Rolled products [3] do	1,146	1,204	1,188	1,226	1,176
Lead:					
Lead-zinc ore do	2,287	2,364	2,358	2,439	2,612
Metal content of ore	113,884	113,105	r 106,251	r 102,600	e 103,000
Concentrate	135,804	134,398	126,444	125,496	e 126,000
Smelter	117,481	117,224	116,166	110,023	e 113,000
Refined	104,174	101,085	101,504	97,525	93,850
Rolled products	18,256	19,445	16,258	13,420	NA
Manganese ore	8,132	7,784	8,097	r 8,616	9,821
Mercury:					
Ore	198,089	242,699	264,086	272,360	e 275,000
Metal 76-pound flasks	15,838	17,318	16,419	15,896	15,890
Selenium kilograms	1,869	3,828	7,911	9,325	e 10,000
Silver thousand troy ounces	3,792	4,037	4,148	3,651	3,075
Tungsten, concentrate, gross weight	16	121	e 130	----	----
Zinc:					
Metal content of ore	88,285	91,801	91,819	85,241	e 86,000
Concentrate	126,960	132,711	132,977	r 130,315	e 131,000
Smelter	22,009	25,290	24,729	28,159	e 29,000
Electrolytic [4]	20,222	19,222	21,336	22,930	e 24,000
Rolled products	10,063	12,233	14,015	15,632	e 16,000
Nonmetals:					
Asbestos:					
Ore	253,407	264,780	230,724	205,110	e 230,000
Fiber	8,232	8,419	9,603	7,630	9,021
Barite, crude	104,486	101,670	97,110	80,189	e 90,000
Cement:					
Portland thousand tons	2,825	3,018	3,078	r 3,211	e 3,313
Other do	22	21	25	r 21	NA
Feldspar, raw	29,885	33,794	55,935	r 41,570	e 42,000
Gypsum:					
Raw	138,046	154,739	167,204	r 168,694	e 170,000
Calcined	39,330	44,314	40,260	40,968	e 41,000
Lime:					
Burned thousand tons	860	907	1,113	1,138	1,199
Hydrated	90,044	129,229	165,988	189,583	e 190,000
Mica kilograms	35,300	11,660	53,890	54,630	NA
Mineral fertilizers:					
Phosphatic thousand tons	731	968	801	1,012	e 1,100
Others do	347	421	461	499	e 600
Pyrites (concentrates, gross weight)	356,459	427,802	406,773	378,134	e 425,000
Refractories:					
Fire clay:					
Raw	210,346	232,354	245,080	247,244	e 250,000
Burned	39,393	43,520	46,590	46,314	e 47,000
Magnesite:					
Raw	411,959	497,420	525,941	526,685	e 424,762
Calcined	26,466	32,068	28,163	25,631	e 27,000
Sintered	155,016	177,933	195,880	188,807	e 160,000
Other [5]	215,645	254,129	281,161	NA	NA

See footnotes at end of table.

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Table 1.—Yugoslavia: Production of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Nonmetals—Continued					
Salt:					
Sea	32,618	52,748	40,338	34,283	e 38,000
Brine	133,934	131,230	133,241	130,221	e 130,000
Other nonmetals	512,725	677,592	736,115	712,439	e 710,000
Mineral fuels:					
Coal:					
Bituminous—thousand tons	1,286	1,262	1,169	1,150	908
Brown—do	9,945	10,715	10,509	10,079	9,023
Lignite—do	16,191	17,534	18,279	18,080	16,535
Briquets	15,899	3,963	22,667	23,215	e 24,000
Coke:					
Metallurgical—thousand tons	1,009	1,089	1,153	1,165	e 1,219
Breeze—do	81	70	100	62	e 60
Gaswork—do	17	17	14	r 11	e 10
Manufactured gas—million cubic feet	1,964	2,144	2,263	2,212	e 2,200
Natural gas—do	7,131	10,224	12,317	r 14,207	16,313
Petroleum:					
Crude—thousand tons	1,611	1,799	2,063	2,222	2,374
Refinery products:					
Gasoline—do	344	385	546	788	886
Kerosine—do	89	98	82	94	94
Diesel fuel—do	618	701	890	1,142	1,389
Lubricants—do	112	126	134	160	318
Heating oil—do	480	683	1,148	1,764	1,816
Carbon black	4,281	4,907	5,099	6,560	e 6,500
Bitumen—thousand tons	120	151	112	140	e 150

p Preliminary.
r Revised. e Estimate. NA Not available.
1 Including aluminum alloys.
2 Including copper alloys.
3 Including pipes.
4 Included with "smelter" zinc above in arriving at total smelter zinc listed for Yugoslavia in world production of smelter zinc.
5 Includes shamotte, magnesite, chrome-magnesite, other refractory materials, and silica bricks.

TRADE

Although complete 1967 trade returns for Yugoslavia were not available in time for inclusion in this chapter, it is evident that mineral commodities occupied as important a position in total trade as they did in 1965 and 1966 when their relationships to total commodity trade were as follows:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	173.6	1,091.3	15.9
1966	204.1	1,220.1	16.7
Imports:			
1965	299.5	1,288.5	23.2
1966	366.4	1,575.4	23.3
Trade balance:			
1965	−125.9	−197.2	XX
1966	−162.3	−355.3	XX

XX Not applicable.

West Germany was the foremost recipient of Yugoslavian mineral commodity exports in 1966 receiving goods valued at $25.4 million while the U.S.S.R. randed a close second ($24.6 million), Italy third ($22.3 million), and the United States fourth ($21.9 million). The U.S.S.R. was by far the first-ranked source of the country's mineral imports, supplying materials valued at $70.9 million in 1966, followed by Czechoslovakia ($36.6 million), Italy ($28.7 million), the United Kingdom ($27.7 million), and the United States ($24.9 million).

The largest commodity group among Yugoslavia's mineral exports was nonferrous metals, with a reported value of $80.6 million, followed by iron and steel ($40.1 million), and petroleum and its products ($19.9 million). Among Yugoslavia's imports, iron and steel was the largest commodity group, accounting for $147.1 million, and petroleum and its products ranked second with a balue of $49.9 million.

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Table 2.—Yugoslavia: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Bauxite	1,162,107	1,492,271	West Germany 649,856; U.S.S.R. 357,916; Italy 248,835; East Germany 98,568.
Alumina	11,602	13,020	Austria 5,142; Netherlands 3,079; U.S.S.R. 1,898.
Scrap and filings	2,422	148	All to Switzerland.
Aluminum unwrought	1,180	1,673	Italy 1,655.
Semimanufactured products	21,659	18,127	United States 5,994; India 3,082; Czechoslovakia 2,267; Poland 1,341.
Antimony regulus	2,297	2,012	United States 1,254; Poland 400; West Germany 180.
Bismuth, unwrought	54	47	West Germany 19; United States 10; Netherlands 10.
Chrome:			
Ore	1,192	----	
Concentrate	12,460	13,070	Czechoslovakia 12,570; Greece 500.
Copper:			
Scrap and filings	589	543	All to Italy.
Alloys unwrought	25	179	Italy 108; Sweden 13.
Semimanufactured products	18,366	31,859	U.S.S.R. 6,189; Italy 4,701; United States 3,816; West Germany 3,779; India 2,368.
Iron and steel:			
Iron ore	97,229	----	
Scrap	10,095	9,383	Italy 5,242; West Germany 3,993.
Pig iron and ferroalloys	25,825	32,886	Italy 7,977; United States 5,044; West Germany 3,526; Austria 3,284.
Steel ingots and billets	----	1,942	All to Italy.
Semimanufactured products:			
Shapes	69,507	67,840	U.S.S.R. 30,024; Italy 12,009; West Germany 8,509; Poland 6,368.
Plates and sheets	3,860	13,737	Italy 6,861; West Germany 2,605; Czechoslovakia 1,791.
Hoop and strip	----	560	Rumania 481.
Railway rails and accessories	25,082	37,300	Rumania 30,448; Italy 4,718; East Germany 1,000; Bulgaria 519.
Wire, excluding wire rods	5,900	6,176	Iran 1,553; Cuba 1,432; West Germany 1,164; Italy 1,120.
Tubes and pipes	73,157	88,694	East Germany 26,453; West Germany 10,898; Czechoslovakia 9,695; Italy 7,394.
Iron and steel castings	9,257	10,388	Poland 3,146; West Germany 2,668; East Germany 2,060; Czechoslovakia 892.
Total	186,763	224,695	
Lead:			
Refined	54,143	52,417	United States 25,005; U.S.S.R. 14,969; India 1,925; Italy 1,895.
Alloys	1,110	1,978	United Kingdom 1,008; Switzerland 350; Italy 265; Austria 262.
Cable lead	3,879	4,713	United Kingdom 2,315; Austria 1,788.
Semimanufactured products	2,967	2,346	NA.
Mercury, metal, 76-pound flasks	13,775	14,214	United States 6,120; U.S.S.R. 2,900; West Germany 2,379; United Kingdom 2,292.
Zinc:			
Concentrates	20,415	10,754	France 4,327; Poland 2,319; United Kingdom 2,144.
Electrolytic	2,873	5,325	Italy 3,397; Switzerland 604; United States 600; India 304; Czechoslovakia 200.
Semimanufactured products and powder	r 10,201	12,139	West Germany 6,040; France 1,509; Denmark 1,436; United States 997; Czechoslovakia 700.
Nonmetals:			
Asbestos, fiber and flour	4,457	1,723	United States 1,467; Japan 150.
Barite, raw and ground	62,613	47,883	U.S.S.R. 29,805; Hungary 12,640.
Bentonite	14,230	13,699	East Germany 4,797; Czechoslovakia 4,232; West Germany 2,228.
Carbon black	1,013	1,310	Bulgaria 630; East Germany 440; Hungary 240.

See footnotes at end of table.

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Table 2.—Yugoslavia: Exports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals—Continued			
Cement:			
Portland	180,760	143,132	Libya 60,050; Ivory Coast 48,200; Malta 17,628; Kuwait 9,500.
Other	58,807	46,128	Sudan 25,300; Italy 4,900; United States 3,895; West Germany 2,615.
Diatomite	3,630	3,561	Greece 1,474; West Germany 1,108.
Feldspar	25,176	20,379	Poland 8,664; East Germany 6,735; Austria 2,664; Italy 960; Hungary 943.
Fertilizers, manufactured:			
Nitric	422	6,020	Cyprus 5,000; Czechoslovakia 480; West Germany 350.
Phosphatic	214,153	354,481	Poland 162,110; Bulgaria 85,707; United Arab Republic 33,796; Italy 30,537.
Fire clay:			
Raw	3,812	1,478	Italy 1,441.
Calcined	5,099	----	
Lime:			
Calcined	3,627	1,360	All to Italy.
Hydrated	1,550	1,275	All to Libya.
Magnesite:			
Raw	4,047	2,855	Rumania 1,390; Poland 1,315; Bulgaria 105.
Calcined	21,847	17,068	Poland 5,803; Netherlands 4,971; West Germany 1,575; East Germany 1,518.
Sintered	95,184	83,088	United States 17,956; Ireland 16,661; Poland 15,860; Italy 12,451; Canada 8,282.
Pyrites, concentrates	161,592	190,151	Greece 81,294; United Arab Republic 38,480; West Germany 29,494; Czechoslovakia 14,990.
Refractories:			
Shammot bricks, tiles and others	8,190	10,845	Poland 5,553; Czechoslovakia 3,324; Greece 853.
Dinas, bricks, tiles	10	15	West Germany 8.
Silica, bricks, tiles	96	NA	
Magnesite, bricks, tile	26,849	21,752	Rumania 9,804; Poland 3,937; West Germany 3,676; France 932; Italy 807.
Chrome-magnesite, bricks tiles, and others	20,958	12,173	West Germany 3,141; Rumania 2,024; Italy 1,818; Sweden 1,258; Poland 1,136.
Other refractory bricks, tiles and others	1,470	3,760	Italy 2,232; Poland 1,526.
Mineral fuels:			
Coal:			
Bituminous	3,158	3,567	Greece 2,000; Italy 960.
Dust	82,326	81,832	Italy 80,870.
Brown	21,532	4,392	Austria 4,153.
Dust	----	20	All to Italy.
Lignite	23,509	23,852	Italy 23,229; Austria 563.
Gas, liquefied	3,422	6,312	Austria 4,328; Italy 1,571.
Petroleum:			
Crude	144,727	324,017	Austria 321,236; United Kingdom 2,781.
Refined products:			
Gasoline	57,647	181,533	United Kingdom 109,258; Italy 47,504; Austria 23,953.
White spirit, kerosine	9,979	13,308	United Kingdom 2,676; U.S.S.R. 2,572; Czechoslovakia 2,557; United States 1,516.
Distillate fuels	41,123	286,707	West Germany 109,819; United Kingdom 63,909; Italy 49,200; United States 33,079.
Residual fuel oils	115,200	317,094	Italy 200,073; Austria 55,172; United Kingdom 33,825; Greece 27,212.
Lubricants	52,726	43,551	India 43,549.
Other products	431	819	Italy 759.
Total refined products	277,106	843,012	Italy 297,537; United Kingdom 209,668; West Germany 109,989; Austria 85,716.

r Revised. NA Not available.

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Table 3.—Yugoslavia: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources in 1966
Metals:			
Aluminum:			
Bauxite	3,393	7,155	British Guiana 3,719; Greece 2,237; Italy 1,138.
Unwrought [1]	19,862	26,119	U.S.S.R. 18,026; United States 2,489; Norway 2,323; Austria 1,237.
Semimanufactured products	1,176	1,207	West Germany 435; Austria 284; Italy 237; United Kingdom 92.
Antimony ore and concentrate	134	163	All from Turkey.
Chrome ore	54,719	40,168	Albania 39,342; Turkey 826.
Cobalt unwrought	25	29	Belgium 28.
Copper:			
Blister	----	----	
Electrolytic	1,834	5,910	United Kingdom 3,684; Chile 1,514; United States 499.
Alloys unwrought	4,444	3,590	Chile 2,175; United Kingdom 911.
Scrap and filings	11,456	4,285	United States 4,172.
Semimanufactured products [1]	2,159	4,915	Chile 1,867; East Germany 786; Belgium-Luxembourg 601; Italy 482.
Iron and steel:			
Iron ore	363,909	393,107	India 357,547; Sudan 35,560.
Scrap	99,062	120,388	United States 114,447; Tunisia 4,084; Lebanon 1,857.
Pig iron and cast iron	224,887	246,324	U.S.S.R. 134,036; Czechoslovakia 65,649; Bulgaria 23,430.
Ferroalloys	1,998	1,580	U.S.S.R. 578; West Germany 393; United States 190.
Ingots and billets	45,717	55,016	Rumania 38,857; Bulgaria 14,027.
Semimanufactures:			
Shapes	111,978	185,503	Czechoslovakia 61,373; U.S.S.R. 23,867; East Germany 22,198; Rumania 20,983.
Plates and sheets	405,091	478,818	U.S.S.R. 76,076; Poland 70,503; Czechoslovakia 59,607; Italy 58,963; France 54,295.
Hoops and strips	47,114	74,897	Czechoslovakia 49,324; Hungary 6,849; Italy 4,059; Poland 3,646; West Germany 3,126; U.S.S.R. 3,116.
Railway rails	977	3,364	West Germany 2,983; East Germany 160.
Wire, excluding wire rods	19,409	32,612	Czechoslovakia 15,723; West Germany 8,394; Austria 3,088; U.S.S.R. 2,377.
Tubes and pipes	23,811	45,984	Czechoslovakia 10,752; United Kingdom 8,075; Hungary 7,224; West Germany 6,169; Italy 5,571.
Castings and forgings	3,032	2,184	West Germany 910; Austria 530; Italy 289; Poland 194.
Total	611,412	823,362	
Lead:			
Concentrate	----	12,737	All from United Kingdom.
Scrap	2,650	3,468	Canada 827; Ceylon 600; Cyprus 474; United States 464.
Refined	317	1,589	All from Bulgaria.
Semimanufactures	48	----	
Manganese:			
Ore	44,113	35,056	India 14,793; U.S.S.R. 10,815; Morocco 5,820.
Unwrought	76	111	U.S.S.R. 61; Netherlands 25.
Nickel:			
Unwrought and alloyed	571	514	United Kingdom 305; U.S.S.R. 100; Canada 54; United States 27; West Germany 25.
Semimanufactured products	160	123	West Germany 52; Italy 16.
Rutile and titanium ores	1,136	1,870	Australia 1,261; West Germany 459; U.S.S.R. 150.
Tin:			
Unwrought long tons	1,118	1,377	United Kingdom 908; Malaya 199.
Semimanufactured products do	13	35	West Germany 19; United Kingdom 14
Tungsten concentrates	58	----	
Vanadium-tantalum and zirconium ores and concentrates	304	NA	
Zinc:			
Concentrate	----	1,008	All from Iran.
Metal	r3,008	1,672	Bulgaria 1,442.
Semimanufactured products	141	245	West Germany 146; United Kingdom 98.
Ores and concentrates of other unspecified nonferrous metals	2,106	NA	

See footnotes at end of table.

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Table 3.—Yugoslavia: Imports of selected mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources in 1966
Nonmetals:			
Abrasives, natural	271	463	Italy 179; West Germany 82.
Asbestos	12,945	13,376	U.S.S.R. 7,392; Canada 3,264; Republic of South Africa 1,906.
Bentonite	6	----	
Borates, natural	607	1,373	Turkey 1,150; United States 223.
Cement:			
Portland	563,171	572,730	Hungary 246,510; Rumania 227,295.
Others	106	936	Belgium 700; West Germany 100.
Chalk	167	157	East Germany 125.
Cryolite, natural	NA	10	All from Italy.
Fertilizers:			
Natural phosphates, raw	471,843	688,281	Tunisia 262,300; Jordan 208,303; Israel 64,889.
Potash, raw	5,760	----	
Natural sodium nitrate	3,500	----	
Manufactured:			
Nitric	253,189	422,861	Austria 148,424; Italy 107,914; Switzerland 106,931.
Phosphatic	9,190	11,303	All from United Arab Republic.
Potassic	202,638	309,799	East Germany 132,574; U.S.S.R. 97,789; Italy 57,625.
Mixed	13,890	----	
Fire clay:			
Raw	11,190	11,467	Czechoslovakia 8,757.
Burned	31,711	30,265	Czechoslovakia 21,708.
Fluorite natural	3,279	3,529	East Germany 1,513; Bulgaria 1,131.
Fluorspar, raw	204	711	East Germany 437.
Graphite:			
All kinds	1,047	934	Austria 501.
Kaolin	27,562	23,370	Czechoslovakia 16,813; East Germany 3,769; Greece 1,435.
Magnesite, calcined	----	25	All from Austria.
Magnesite, sintered	100	----	
Mica, all kinds	1	6	United Kingdom 4; India 2.
Refractory bricks:			
Shamotte	5,699	7,584	West Germany 5,548; Poland 661; Italy 478.
Silica	774	459	Belgium 179; Poland 129; West Germany 105.
Magnesite	7	323	All from Poland.
Others	2,329	1,763	France 414; West Germany 337; Poland 331; Italy 215; United Kingdom 204.
Salt	161,782	166,615	Rumania 116,499; Tunisia 19,927.
Sulfur	15,427	14,423	France 6,244; Greece 5,627;
Talc, natural	9,888	1,604	Czechoslovakia 1,082; India 200.
Mineral fuels:			
Asphalt, natural	55	1,337	Rumania 1,027.
Coal:			
Anthracite	151,947	134,349	U.S.S.R. 134,267.
Bituminous:			
Coking	1,419,504	1,506,078	U.S.S.R. 968,769; United States 537,249.
Other	555,037	164,024	All from Poland.
Gas	59,026	18,427	Poland 16,648; Czechoslovakia 1,784.
Forge	40	40	All from West Germany.
Briquet	----	13,131	All from U.S.S.R.
Coke:			
Metallurgical, all kinds	85,654	130,802	Czechoslovakia 72,487; Poland 41,066; West Germany 13,214.
Foundry	2,393	8,829	Czechoslovakia 7,272; Italy 993.
Petroleum coke	21,489	26,410	United States 22,700; West Germany 3,709.
Other coke and coke briquet	--	32,096	United Kingdom 17,047; Austria 7,550; Poland 6,485.
Petroleum:			
Crude	1,107,004	2,202,197	U.S.S.R. 762,330; Iraq 750,818; Iran 584,767; Algeria 80,664.
Refinery products:			
Gasoline	27,627	29,753	U.S.S.R. 20,963; United Kingdom 7,208; Italy 1,561.
White spirit and kerosine	2,572	8,710	All from U.S.S.R.
Distillate fuels	r 100,583	117,549	Rumania 74,106; Bulgaria 29,908; United States 8,004.
Residual fuel oils	r 36,478	67,024	Rumania 62,893; Greece 3,497; Italy 633.
Lubricants	r 29,230	47,731	Rumania 14,233; U.S.S.R. 7,266; United Kingdom 7,101; Italy 6,443.
Mineral jelly and waxes	6,374	7,043	U.S.S.R. 2,736; Rumania 2,169; East Germany 1,561.
Other products except petroleum coke	172,073	107,516	Venezuela 35,897; United Kingdom 31,309; Netherlands 16,243.
Total	374,937	385,326	

NA Not available. r Revised.

[1] Including alloys.

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COMMODITY REVIEW

METALS

Aluminum.—Rich bauxite deposits were discovered on the Gulf of Maslenica in the Adriatic littoral. Reserves were estimated at about 10 million tons, in an area 10 kilometers in diameter.

A new bauxite mine started production on Volujak Mountain in Kosovo-Metohija Oblast. Reserves were estimated at 2.5 million tons with an average Al_2O_3 content of 53 percent.

Construction of the Titograd Aluminum Plant was still in planning and preparatory stages at yearend 1967. Negotiations with the International Bank and several foreign firms for a loan and know-how were not successfully concluded. The Titograd plant will have an annual capacity of 200,000 tons of alumina and 50,000 tons of aluminum. Completion date was not set because of unsettled financing, but authorities believe that 3 years will be required for construction.

To strengthen and promote further development of the aluminum industry in Dalmatia and Hercegovina, the industry of Croatia organized the Jugal association. The decision of the Yugoslav Government to drop construction of the Mostar Aluminum plant in favor of of the Titograd plant was not favorably received by the Croatian part of the aluminum industry. Jugal was pushing hard to get funds for the Mostar project and to develop new facilities in Dalmatia.

Cadmium.—New zinc industry facilities at Celje and Kosovska Mitrovica are expected to yield 200 tons of byproduct cadmium annually, raising the country's total output to 220 to 250 tons per year, all obtained as a zinc industry byproduct.

Copper.—In addition to expanding facilities at Bor and Majdanpek, intensive exploration for copper was carried out in Eastern Serbia during 1967. As a result a large deposit of copper was discovered near the village of Veliki Krivelj, not far from Bor. Average copper content of ore is 0.4 percent and ore reserves reportedly total 200 million tons.

Expansion of copper producing facilities at Bor and Majdanpek continued during 1967. When completed, annual electrolytic copper output will reach 95,000 tons. Annual copper-ore production at the Majdanpek open pit will be increased to 11 million tons. Completion date for the second phase of the Bor-Majdanpek expansion is 1972.

At the Bor copper mine, work has been started on opening a new section of the Coka Dulkan open pit. At the same time three new blind shafts were being driven in the underground part of the Bor mine.

At the Bor smelter, a copper powder plant was commissioned with an annual capacity of 200 tons. The expansion of smelting and electrolytic facilities as well as the construction of a sulfuric acid plant continued. At Majdanpek construction of a new flotation plant was completed in the summer of 1967, and equipment from West Germany will be installed in the near future.

Iron and Steel.—The main problem of the Yugoslav iron ore industry continued to be beneficiation of Bosnian ores. The Demir Hisar and Tajmište mines in Macedonia with reserves estimated at about 100 million tons will go into production in the first quarter of 1968. The two mines form the iron ore base for the new integrated iron and steelworks at Skopje, Macedonia, that started production on October 20. This plant has a 300,000-ton-per-year ingot capacity and corresponding rolling facilities. According to plans, annual production will be raised to 600,000 tons of steel and 400,000 tons of rolled products by 1973.

Reconstruction of the Smederevo Iron and Steel Works continued. Experts from the U.S.S.R. were building Yugoslavia's largest blast furnace, a 2,000-ton-per-day installation. Fuel for the works will be natural gas from Banat that will be delivered by pipeline that was under construction at yearend.

The country's largest integrated iron and steelworks, Zenica plant, will expand its annual capacity to 1.6 million tons by 1970. The U.S.S.R. will provide the necessary equipment. At the same time the Zenica management closed plant I after 30 years of service. Modernization of plant II has compensated for loss of this production capacity.

Gold.—Gold production in Yugoslavia was a byproduct of nonferrous mining operations during 1967. To increase output, the Bor Combine, the largest gold

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producer in the country, embarked on a thorough overhaul of the existing plant and construction of a new one which will be used for gold contained in quartz. The Trepča Lead and Zinc Combine produced gold at the Lece mine and in 1967 output was over 9,600 troy ounces.

Lead and Zinc.—For the lead and zinc industry of Yugoslavia, 1967 was a significant year. The Trepča Lead and Zinc Combine commissioned a lead smelter at Zvečan and an electrolytic plant at Kosovska Mitrovica and financed large-scale exploration throughout Yugoslavia. The new Zvečan smelter with a capacity of 170,000 tons of lead annually, is the fourth largest lead smelter in Europe and one of the most modern. Loans from banks in the United Kingdom were used to purchase the equipment. The Kosovska Mitrovica electrolytic zinc plant has an annual capacity of 40,000 tons of zinc, 110 tons of cadmium, and 75,000 tons of sulfuric acid. The most favorable areas located by the Trepča Combine's exploration activities were at Kopaonik and Besna Kobila mountains.

The construction of a new lead and zinc smelter at Titov Vales was started. Authorities in Macedonia decided to increase annual capacity of the plant from that previously announced to 75,000 tons of lead, 52,000 tons of zinc, and 120,000 tons of sulfuric acid. The equipment will be purchased in Great Britain.

In Montenegro, near Mojkovac, development of the Brskovo Mine and construction of its beneficiation plant were behind schedule at yearend 1967, and it was doubtful that production will start by 1970 as originally planned. It is expected that three mines in the area, Brskovo, Igrista, and Žuta Prla will produce about 500,000 tons of lead and zinc ore annually when construction is completed.

Manganese.—Several million tons of manganese ore reportedly have been discovered near Buzin close to Bosanska Krupa. Facilities developed there are modest; the new beneficiation plant has a capacity of 30,000 tons of raw ore per year. Near Kičevo in Macedonia deposits containing 6 million tons of manganese ore suitable for sintering were discovered. A mine and related facilities for production of 190,000 tons of raw ore and 75,000 tons of manganese sinter per year are planned.

Mercury.—The Idria mine in Slovenia remained Yugoslavia's largest mercury producer, but owing to high demand, the old Avala mercury mine at Šuplja Stena, near Belgrade was reactivated in October 1967. The known and developed ore reserves at Avala contain about 4,350 flasks of mercury and yearly output was set at 1,160 flasks. The venture appears to be economically sound because there will be minimal investment and exploration costs.

Preliminary exploration around Gornji Vakuf in Bosnia lead to the discovery of a mercury deposit. Reportedly mercury metal reserves total 50,000 tons.

Nickel.—After 4 years of exploration, establishment of Yugoslavia's first nickel mine and facilities for nickel metal production appeared assured. The installations will be based on deposits amenable to opencast mining on Goleš Mountain near Pristina in Serbia, with reserves that reportedly total 7.5 million tons of ore containing 1.36 percent neckel. Plans call for an output of 3,500 tons of nickel per year.

Rhenium.—In 1967 exploration by the Institute for Nuclear Raw Materials discovered rhenium in molybdenum ore from the Mačkatica molybdenum mine which was closed for 15 years as unprofitable, but may be reopened soon. Total reserve of rhenium was set at 40 tons.

Uranium.—A new uranium ore deposit was discovered at Žirovski Vrh near Gorenja Vas in Slovenia, between Skofija Loke and Idria. Of 21 holes drilled, 16 showed ore which averaged 1,200 grams of uranium per ton.

NONMETALS

Asbestos.—The Korlače Asbestos Mine near Raska in Serbia was being modernized during 1967. The most important aspects of the reconstruction were the addition of a beneficiation plant, construction of roads on the mine property, and the purchase of cars and trucks. At yearend the drying plant in the beneficiation complex was completed.

Facilities at the asbestos mine at Bosansko Petrovo Selo near Tuzla in Bosnia were being expanded during the year. When the modernization is completed, annual ore output will be increased from 6,000 tons to 40,000 tons.

Cement.—During 1967 domestic cement supply was inadequate, necessitating imports. Yugoslavia's cement plants were in

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most cases antiquated and were being modernized during the year.

The Dalmacija Cement Factory at Split was installing a new rotary furnace with a daily capacity of 1,000 tons. When modernization is completed, the plant will produce 1.4 million tons of cement annually. West German and Yugoslav domestic industry will provide the necessary equipment for the modernization.

The cement plant at Podsused near Zagreb made arrangements for production expansion in 1967. The building industry will provide financing for expansion that will add 160,000 tons per year to plant output.

The Beočin Cement Factory near Novi Sad was connected by a pipeline with gasfields in Banat. Natural gas will become the principal fuel at this plant, which is to be expanded to a capacity of 820,000 tons per year by 1970.

The Popovac Cement Factory near Paracin in Serbia was also being reconstructed during 1967. The first phase of expansion will add another 105,000 tons to annual capacity starting at yearend 1968. A second phase of expansion scheduled for completion in 1970 will bring plant output to 800,000 tons per year from the 1967 level of 345,000 tons. At the Usje Cement Plant in Skopje, a new section was completed bringing the annual capacity of the plant to 440-000 tons per year doubling its previous capacity.

Fertilizer Materials.—Recently concluded exploratory work on a phosphate deposit at Lisina, near the Bulgarin border, reportedly has developed reserves of around 100 million tons of phosphorite, averaging 12 percent P_2O_5.

The Kutina Nitrogen Fertilizer Plant near Zagreb, began test production at the end of 1967. Normal production is scheduled to start in the first half of 1968 at the annual output rate of 800,000 tons of fertilizers. Large reserves of natural gas and limestone in the area will provide adequate raw materials for the plant.

Gypsum.—The gypsum plant at Kosovo near Knin in Croatia resumed production in February 1967, and a new mill was put into operation. In the fall of 1966 flooding damaged the plant severely, and while the damage was being repaired the factory was also modernized.

In Macedonia along the Raduša river, gypsum reserves amounting to 15 million tons were discovered. At yearend negotiations with several banks were underway to secure funds for construction of a gypsum plant at Debar.

Kaolin.—Kaolin deposits were discovered near Valjevo in Serbia with reserves estimated at about 1 million tons. Exploration of the whole area between Valjevo and Belgrade for additional kaolin was carried out during the year but results were not announced.

Lime.—A new 45,000-ton-per-year plant began production in Despotovac, Serbia, at the end of 1967. In Zabradje near Bor in Serbia a 25,000-ton-per-year lime plant went on stream in the fall of 1967. The output of this facility will be used by the copper flotation plant at Bor.

Magnesite.—In the fall of 1967 the Brezak magnesite mine with an annual capacity of 90,000 tons of white magnesite was commissioned near Cacak in Serbia. The Magnacrome Refractory Factory at Kraljevo will be the principal user.

Salt.—In the winter of 1967 after several years of construction, Tusanj, the first rock salt mine in the country was completed with the assistance of Polish experts. High water pressure required freezing of the ground for completion of shafts. In 1970 the mine is expected to produce 700,000 tons of salt per year.

Tuff.—Large deposits of tuff have been discovered close to Livno in Bosnia. The engineering staff of the existing Brown Coal Mine at Tušnica, will be in charge of a new open pit tuff mine which will be developed soon. Annual capacity of the tuff mine is planned at 20,000 tons.

MINERAL FUELS

While the petroleum industry made significant breakthroughs in the energy market, and the coal industry had several setbacks, coal remained Yugoslavia's principal energy source during 1967. Two years of economic reform led to larger consumption of imported solid fuels, domestic and imported liquid fuels, and domestic natural gas.

The domestic coal industry, artificially supported in the past under centralized economic planning, retrenched and consolidated on a more solid economic footing. Several mines were closed, production

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was lowered because of high stocks and low demand, and many miners were laid off. Only highly productive units could continue to operate profitably under the new rules of stiff competition. Because of large amounts of low-grade coals on hand, the industry was reconsidering its role in the new situation. Studies undertaken by coal producers indicated that conversion of lignite to higher forms of energy at or near the mine could hold the solution to present economic problems of coal. The latest plans stress mine mouth electric power production from lignite rather than coal gasification.

The petroleum industry had a successful year in 1967, continuing to make impressive production gains in both the output of crude oil and natural gas and in the refining of derivatives. In addition, 1967 saw important construction progress, after previous delays, on three refineries and the cross-country oil pipeline. However, there were complaints about the lack of intra-industry coordination in planning refinery expansion, and the continuing deficit between domestic crude oil production and consumption. In 1967 domestic output covered only about 50 percent of national crude oil consumption. However, the relativity low refinery product consumption in Yugoslavia left some quantities for export and thus compensated in part for the cost of crude oil imports.

Coal.—Coal output was 2.8 million tons lower than that of 1966, and the overall picture of the Yugoslavian industry was not bright. The lack of domestic coking coals has necessitated substantial imports.

Lignite—New lignite reserves, estimated at 3 billion tons, were discovered in Yugoslavia's foremost lignite area, the Kosovo Basin, near the village of Kilna, Kosovo—Metohija Province, Serbia. Here, the seams were 40 to 70 meters thick at depths of 15 to 20 meters.

Development of a chemical industry based on Kosovo lignite continued, and the first semi-coke was produced from Kosovo lignite. Construction of a gasification plant at Obilic was underway and plans for a gas pipeline to the Skopje iron and steel plant were completed. After the arrival of equipment for the Velenje gasification project in Slovenia, the project was dropped as economically unsound. At yearend, since the available equipment could not be sold, the nearby Celje Zinc Plant Enterprise (Cinkarn Celje) showed some interest and probably will try to develop a chemical industry based on Velenje lignite.

In Lukavac, the largest mine of the Kreka Lignite Basin in Bosnia, production was interrupted by a fire in early 1967. Damage was sizable and most of the equipment in this highly mechanized mine was lost. In the same year the management of the Kreka Basin closed three unprofitable underground mines and at the same time opened several opencast mines where production costs will be lower, partly as the result of laying off over 800 miners.

Petroleum and Gas.—The two leading Yugoslav petroleum enterprises, Industrija Nafte (INA) and Naftagas, drilled about 220,000 meters during 1967. Most of the holes were located in the Pannonian Basin of northern Yugoslavia.

INA, operating in Croatia and Slovenia, was by far the largest operating oil enterprise in the country, producing 71 percent of total Yugoslav crude oil output, about 52 percent of natural gas production and operating two refineries, Rijeka and Sisak. Exploration conducted by INA crews led to the first discoveries of oil and gas in the Adriatic Region of the country.

During 1967 the Stružec field, 60 kilometers east of Zagreb, was the largest producing oilfield in the country, producing 515,000 tons of crude petroleum. In the course, of the year, INA started production from two new fields, Jagnjedovac and Šandrovac, in Croatia. Jagnjedovac, a medium-sized field between Koprivnica and Bejelovar on the western slopes of Bilogora was discovered in 1961, and brought into production at the beginning of 1967. Operations in the field are reportedly highly automated and its peak annual production will be about 100,000 tons of crude. The field was connected to the Sava River Valley pipeline network by a new pipeline running from the village of Mučna Rijeka to Graberje.

The Šandrovac field, 12 kilometers northeast of Bjelovar in Croatia will have a yearly peak output of 250,000 tons. Reportedly the field is fully automated and crude oil reserves are estimated at about 5 million tons. The same pipeline that connects the Jagnjedovac field with the Sava River Valley network is used to deliver crude oil from Šandrovac to the refinery at Sisak.

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After several years of low-scale exploration of the Adriatic coast, INA drilled several exploratory wells in this area in 1967. Results were encouraging, and oil was discovered at Dugi Otok island. At yearend one rig was drilling near Pula in Istria and a second was operating at Dugi Otok, where drillings is complicated by severe corrosion problems caused by hydrogen sulfide and the high sulfur content of the crude oil. Special corrosion resistant drilling tools had to be bought in France in order to continue operations.

Because of the possible importance of the Adriatic Sea as an oil producing area, the Governments of Italy and Yugoslavia conducted negotiations for the delineation of offshore boundaries. Final agreement is expected in early 1968. The Yugoslavs were seeking foreign capital and knowhow to develop offshore deposits, but at yearend no foreign firm had concluded arrangements with the Yugoslavs for joint operations.

Naftagas, Yugoslavia's second largest oil enterprise, operated oil fields in Serbia, conducted exploration in Macedonie and was building a refinery in Pančevo, in 1967. About 29 percent of Yugoslavia's crude oil in 1967 was produced by Naftagas. All of its operating fields were located in northern Serbia—Banat and Bačka. After intensive geological and geophysical exploration, preparations were underway for drilling several deep wells at locations near Ovče Polje, Tikveš, and Skopje.

The management of the Rijeka refinery planned to expand its annual capacity to 4 million tons of crude oil by 1970. The Italian company, Societa Nazionale Metandoti Progetti (SNAM Progetti), will design the facilities.

At the Sisak Refinery a 40,000-ton-per-year petroleum coke plant was commissioned in the summer of 1967. Provision has been made to double the capacity in the future.

The Bosanski Brod Refinery was under construction during 1967. When completed the refinery will have a capacity of 2.5 million tons of crude oil per year. Because of financial difficulties, the completion date was postponed from late 1967 to early 1968.

After solution of some administrative and financial problems, construction of the new 1.3 million-ton-per-year refinery at Pančevo near Belgrade continued, with completion scheduled for the summer of 1968. At Novi Sad, about 80 kilometers north of the Pančevo Refinery, another new refinery was under construction during 1967. This refinery, with an annual capacity of 600,000 tons of crude oil, is slated for completion at yearend 1968. Equipment for the facility was purchased in the United Kingdom.

Construction was started on the 685-kilometer Yugoslav oil pipeline, which is to connect the nations' refineries and oil fields with the Danube at its eastern end and with the Adriatic Sea at its western terminus. The project was jointly financed by INA (42 percent), which is also responsible for its construction; the Bosanski Brod Refinery (29 percent); Hemiska Industrija Pančevo (21 percent); and Naftagas (8 percent). Total constructions costs were reported to be equivalent to about $56 million. The new pipeline is the first major investment funded solely from the pooled resources of enterprises and not from Yugoslav federal funds.

Initial capacity of the pipeline will be 10 million tons of crude oil annually which can be boosted to 17 million tons with additional pumping stations. The principal pipeline users will be domestic refineries, but Hungary and Czechoslovakia may use the line for crude oil imports from Africa and the Middle East.

In addition to the transcountry pipeline, several other crude oil and gas pipelines of local significance were completed or were under construction during 1967. In Croatia the Jagnjedovac-Šandrovac-Graberje crude oil line was completed and a parallel gas line was under construction. The length of both pipelines is about 80 kilometers with 12¼-inch pipe diameter. In Banat 42-kilometer gas pipeline with a 8⅝-inch diameter was completed from Žabalj to Beočin. The line brings natural gas to the Beočin cement plant and surrounding communities.

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The Mineral Industry of Zambia

By E. Shekarchi [1]

The mineral industry of Zambia set high records in 1967 in volume of production and export value of minerals. The gross value of minerals, primary metals, and nonmetals produced was estimated at approximately $662.5 million in 1967.

Mineral commodity exports in 1966 comprised 97 percent of the country's total export value and reached approximately $671.5 million.[2] Zambia contributed about 15 percent of total world primary copper production, and the country ranked third among world copper exporters.

In October 1966, the Zambian Government issued its first national development plan. The plan involved an expenditure of $1.2 billion over a 4-year period ending in 1970 to diversify the economy and raise the standard of living. Of the total, $789 million was to be spent in the public sector, including about $83 million for manufacturing, $162 million for transportation and communications, $66 million for agriculture, and about $8 million for mining. The major part of the mining investment, approximately $6 million, will be used in the Southern Province, chiefly for the development of coal deposits.

An important development during 1966 was the first recorded production of coal in Zambia. Annual Zambian coal consumption is over 1 million metric tons, and is used mostly for copper smelting. Prior to 1965 coal was imported from Southern Rhodesia, but events connected with the Rhodesian Unilateral Declaration of Independence made it desirable for Zambia to develop an indigenous source of coal.

Mineral rights previously held by the British South Africa Co. were vested in the President of Zambia on behalf of the Republic at the time of independence. Royalties, which form the largest part of Government revenue, must be paid on all mineral production. For copper, lead, and zinc, the royalties are paid in accordance with complicated sliding scale formulas based on prices as determined by the London Metal Exchange (LME). Royalty payments for these and other minerals are explained in Zambia's Prospecting License Application, Mines Form No. 8.

In January 1966, settlement was reached between the mining companies and the Zambian Mine Workers' Union, which represents some 37,000 local employees of the copper-mining industry. Under the provisions of the settlement, the employees were transferred from a daily to a monthly pay basis, and granted wage increases and other benefits. Owing to strikes in subsequent months, an appointed commission headed by Roland Brown recommended a 22-percent wage increase. Accompanying the Brown Commission report, the Zambian Government published a white paper indicating that it accepted the main recommendations of the Commission and that it would not interpose its authority in negotiations between the unions and the industry. A committee was formed with representatives of the Government, the mining industry, and the unions to insure that expatriate employees be held to a minimum.

In 1966–67 the development of alternative routes out of landlocked Zambia to the coast reduced the dependence of the copper belt on the railway through Southern Rhodesia. By yearend 1967, despite some difficulties on certain new routes, no further serious interference with the flow of Zambian copper to the world market was seen.

[1] Foreign mineral specialist, Division of International Activities.

[2] Where necessary, values have been converted from Zambian pounds (ZL) to U.S. dollars at the rate of Z£=US$2.80.

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PRODUCTION

The 1967 value of Zambia's mineral production totaled about $663 million, approximately $22.8 million higher than in 1966. Electrolytic and blister copper accounted for 96 percent of the total as indicated in the following tabulation:

Commodity	Value of mineral production (million dollars)	
	1966	1967
Copper, blister and electrolytic	615.7	635.6
Zinc	11.1	12.1
Lead	4.3	3.9
Cobalt	4.6	4.6
Other minerals	4.1	6.4
Total	639.8	662.6

Table 1.—Zambia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Cadmium—kilograms	14,993	14,631	18,158	12,093	e 10,000
Cobalt:					
Metal	682	1,345	1,544	1,515	1,455
Other forms, cobalt content	24	63	----------	(1)	(1)
Total	706	1,408	1,544	1,515	1,455
Copper: r					
Concentrate, copper content	68	68	280	60	60
Blister	137,121	145,431	163,526	88,786	82,755
Electrolytic	438,893	496,884	521,175	586,474	616,844
Other	836	531	193	340	643
Gold [2]—troy ounces	4,960	5,033	5,196	e 5,000	e 5,000
Lead, refined	19,609	13,161	21,345	18,760	19,101
Manganese ore	34,914	36,370	30,813	26,702	24,968
Selenium [3]—kilograms	20,848	55,200	26,115	e 26,000	e 26,000
Silver [4]—troy ounces	846,317	1,445,934	848,819	e 750,000	e 750,000
Tin concentrate, tin content—long tons	1	8	16	3	NA
Zinc: Electrolytic	49,451	46,712	47,436	42,300	44,484
Nonmetals:					
Amethyst—kilograms	15,443	6,714	21,254	36,100	39,839
Cement—thousand tons	116	151	221	r 256	e 300
Gypsum	----------	----------	----------	1,075	1,418
Lime	NA	NA	76,732	NA	NA
Limestone	538,679	567,146	579,400	570,254	578,206
Mica, sheet	----------	2	4	NA	NA
Phyllite	13,026	11,268	19,281	21,530	25,461
Mineral fuels: Coal	----------	----------	----------	114,127	393,067

e Estimate. r Revised, 1963–66. NA Not available.
[1] Less than ½ unit.
[2] Chiefly contained in electrolytic copper refinery muds and blister copper.
[3] Contained in electrolytic copper refinery muds and blister copper.
[4] Refined silver and silver contained in electrolytic copper refinery muds and blister copper.

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TRADE

The value of all mineral commodity exports from Zambia in 1966 was approximately $671.6 million, about 97 percent of total commodity exports in f.o.b. prices. Copper exports alone, valued at $646.4 million in 1966, remained the leading mineral exchange earner, followed by lead-zinc exports.

Table 2.—Zambia: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Cadmium metal	14	9	All to Republic of South Africa.
Cobalt, metal	1,605	1,627	United Kingdom 1,557; Republic of South Africa 36; Australia 34.
Copper:			
Slimes	895	26	Japan 18; Sweden 8.
Metal, unwrought:			
Blister	171,139	85,658	West Germany 38,360; Japan 37,303.
Electrolytic:			
Wire bar	538,900	422,994	United Kingdom 156,279; Italy 54,568.
Cathode form	51,396	89,980	United Kingdom 39,426; West Germany 15,662; Japan 15,203.
Ingot and bar	4,080	537	All to West Germany.
Brass and bronze	3	---	
Iron and steel:			
Scrap	467	NA	
Semimanufactures:			
Castings	139	28	Tanzania 26; Uganda 2.
Pipes and tubes	---	5	All to Malawi.
Lead:			
Bar and ingot	15,648	24,654	Republic of South Africa 9,897; United Kingdom 2,755.
Sheet and bar	---	33	All to Southern Rhodesia.
Manganese, ore and concentrate	36,544	26,107	France 11,767; United States 4,099.
Silver, unworked troy ounces	---	40,000	All to Republic of South Africa.
Tin, ore and concentrate long tons	4	---	
Zinc, ingots and bars	45,163	41,557	Republic of South Africa 25,483; mainland China 2,240.
Old and scrap metal, not further identified.	2,007	918	Southern Rhodesia 393, United Kingdom 312.
Nonmetals:			
Cement for building, including hydraulic lime.	1,494	136	Southern Rhodesia 128.
Lime	818	145	Southern Rhodesia 127; Congo (Kinshasa) 18.
Marble, granite, and other stone	38	NA	
Sand, stone, and gravel	1,669	2	All to Southern Rhodesia.

NA Not available.

Total merchandise imports in 1966 were valued at $388 million; of this, mineral commodities accounted for about $37.4 million or 9 percent of the total. Among metallic mineral commodities imported in 1966, iron and steel, including primary ingots and semimanufactures, pig iron, and ferroalloy, were valued at $15.7 million. In spite of substantial improvements during 1966, the petroleum industry of Zambia remained dependent on foreign fuels to the extent of about $12.2 million. The completion of a pipeline, as well as further development in coal production, will change the fuel picture in 1967.

Table 3.—Zambia: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum semimanufactures	365	361	Republic of South Africa 196; Tanzania 66; Southern Rhodesia 42.
Chromium ore and concentrate.	318	522	Republic of South Africa 420; Southern Rhodesia 102.
Copper and copper alloys, all forms.	872	604	Southern Rhodesia 278; Congo (Kinshasa) 143; Republic of South Africa 115.

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Table 3.—Zambia: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Iron and steel:			
Iron ore and concentrate	43	64	Southern Rhodesia 37; Republic of South Africa 27.
Scrap	520	635	Congo (Kinshasa) 596.
Pig iron, sponge iron, and ferroalloys.	8,250	5,617	Southern Rhodesia 4,846; Republic of South Africa 771.
Ingots and other primary forms	38	125	Republic of South Africa 124.
Semimanufactures	36,330	91,754	Republic of South Africa 64,096; Southern Rhodesia 10,480.
Lead and lead alloys	162	74	Southern Rhodesia 56; Republic of South Africa 15.
Tin and tin alloys—long tons	52	53	Southern Rhodesia 35; Republic of South Africa 16.
Nonferrous ores and concentrates, not further described.	9	---	
Nonferrous metal scrap	926	20	All from Republic of South Africa.
Other old and scrap metal	1,568	14	Southern Rhodesia 11.
Nonmetals:			
Abrasives:			
Grinding and polishing wheels.	98	116	Republic of South Africa 104.
Industrial diamond—carats	9,857	17,505	Ireland 14,587; Netherlands 2,831.
Other, crude	5	2	Republic of South Africa 1.
Asbestos, crude, washed or ground	1,039	1,124	Southern Rhodesia 1,033.
Cement:			
Building, including hydraulic lime	16,737	96,641	Republic of South Africa 39,872; Congo (Kinshasa) 28,872; Southern Rhodesia 20,862.
Clinker	13,998	59,641	Southern Rhodesia 57,297; Republic of South Africa 2,344.
Fire and furnace (including furnace mortar)	1,862	1,040	Southern Rhodesia 711 Republic of South Africa 180.
Fertilizers	57,682	48,559	Southern Rhodesia 21,085; West Germany 8,902; Italy 8,532.
Gypsum and plaster of paris	10,526	16,301	Republic of South Africa 11,879; Southern Rhodesia 3,797.
Lime, building	884	1,456	Republic of South Africa 1,239; Malawi 158.
Clays:			
Fire clay	1,267	1,540	Southern Rhodesia 924; Republic of South Africa 334.
Cornish stone, kaolin, and china clay.	1,188	1,411	Republic of South Africa 1,093; United States 227.
Marble, granite and other monumental stone	213	192	Republic of South Africa 145; Southern Rhodesia 47.
Mica, blocks or sheets	3	6	All from Southern Rhodesia.
Salt	10,892	12,365	Republic of South Africa 8,584; Mozambique 1,964.
Sulfur, crude	5,067	3,070	Canada 3,059.
Mineral fuels:			
Coal and coal products:			
Coal and briquets	1,299,637	906,495	Southern Rhodesia 878,387; Republic of South Africa 28,108.
Coke	67,343	70,961	All from Southern Rhodesia.
Pitch, tar and other coal products	530	145	Southern Rhodesia 51; United States 46; Republic of South Africa 22.
Petroleum refinery products:			
Gasoline—thousand 42-gal. bbls	842	623	Iran 584.
Kerosine—do	112	33	Iran 21; Kenya 6; Saudi Arabia 5.
Jet fuel—do	37	98	Iran 96.
Distillate fuel oil—do	504	582	Iran 526.
Residual fuel oil—do	15	29	Kenya 16; Tanzania 7.
Lubricating oils—do	72	72	Republic of South Africa 64.
Greases, jelly, waxes	1,636	2,824	United States 1,286; Republic of South Africa 1,009; Indonesia 336.
Asphalt and bitumen	5,427	198	Iran 73; Southern Rhodesia 42; Republic of South Africa 37.
Other—42-gallon barrels	3,417	4,341	United Kingdom 2,408; Southern Rhodesia 988; United States 627.

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COMMODITY REVIEW

METALS

Cobalt.—Zambia's cobalt production, an important factor in non-Communist world supply, remained at about 1,455 metric tons in 1967, the same as in the 4 previous years. A newly introduced cyanide-regrind circuit in the cobalt plant of Rhokana Corporation, one of the main producers in 1967, showed considerable improvement in metal recovery.

Copper.—As a result of the Southern Rhodesian Unilateral Declaration of Independence, the copper industry experienced serious difficulties during 1966 in transporting copper to the world market and in bringing necessary fuel into Zambia. These problems continued to a lesser extent during 1967. Another serious development for the industry during 1966 was the sharp rise in production costs stemming from a variety of reasons including substantial wage increases, higher transport costs, and the fuel shortage. The cost rise, most of which is likely to be permanent, changed Zambia from a low-cost to a high-cost producer of copper.

In 1966, the copper industry provided over 92 percent of domestic exports and approximately 70 percent of government revenue, and accounted for 13 percent of African and over 22 percent of European employment in the country.

The major purchasers of Zambian copper in 1966 continued to be the United Kingdom, Japan, West Germany, and Italy, who together bought about 75 percent of the country's production. In 1966, with the decline in production, Zambia dropped to fourth place among the world copper exporters. In 1967, with a substantial gain in output, Zambia moved to third place again.

The large increase in copper output in 1967 was apparently due partly to the slump year of 1966 and partly to the accessibility of coal and the easing of transportation difficulties.

The Anglo American Corporation of South Africa Ltd. group produced about 56 percent of Zambia's total copper in 1966, or approximately 330,000 metric tons, from Mimbula-Fitula near Nchanga and other holdings.

Total production of finished copper from the Roan Selection Trust Ltd. (RST) mines was 230,418 metric tons in the fiscal year ending June 30, 1967, of which the Luanshya Division produced 78,170 tons, Mufulira Copper Mines Ltd. 120,291 tons, Chibuluma Mines Ltd. 17,921 tons, and Chambishi Mines Ltd. about 14,000 tons.

According to RST reports, the company prospected in Zambia throughout 1966 and 1967. In the Copper Belt, interesting mineralization was discovered in two new localities, and detailed exploration of the Babuba and other known deposits was continued by diamond drilling. Exploration in the Chisangwa and Mwinilunga area indicated some new prospects. Some copper sulfide ores were encountered.

At Babuba, a few kilometers from Luanshya, work was progressing on the pilot plant and a shaft was sunk. RST was expecting to complete its investigation of copper deposits in this locality with full detailed assessment of the ore body by 1969.

Conservative estimates of the Copper Belt ore reserves indicate that in the known ore bodies there are about 700 million tons of ore, containing at least 15 million tons of recoverable copper.

The fuel shortage was an important factor in copper refinery production during 1966. With diminishing coal deliveries, Copper Belt producers decided, in the latter part of 1966, to pool available supplies in order to maximize production. In addition, Mulfulira made extensive use of the oil-burning equipment installed in 1966.

During the period of restrictions on smelting and refining, mining operations in the Copper Belt were almost normal, resulting in the accumulation of a considerable tonnage of concentrates, which are expected to be converted into copper by mid-1969.

In April 1966, after RST and the Anglo-American group announced their decision to abandon fixed selling prices for copper and to base their prices on those quoted on the LME, the Zambian Government enforced an export tax on all copper sold at more than $840 per ton at a rate of 40 percent of the amount by which the average monthly LME

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copper price exceeds $840 per ton. Royalties on copper, which form the largest part of the Government's revenue, are 13½ percent of the LME price, minus $22.40.

In 1966, the Zambian Government decided to establish a copper fabrication plant in the Copper Belt. Apparently the partners involved in this joint venture are Phelps-Dodge Corp., with its Swedish partner Svenska Metallverken, RST, Anglo-American, and Continental Ore, as well as Zambia's Industrial Development Corporation.

The combine's first draft plan calls for installation of an extrusion press capable of producing rod and a variety of other shapes. The plant will produce mainly wire cable with an initial annual capacity of 3,000 metric tons of fabricated copper, and also have the capacity to produce 1,000 metric tons of aluminum products annually. By the end of 1967, no concrete agreement had been reached regarding each company's share and responsibility.

Lead and Zinc.—Zambian Anglo-American Ltd. faced continuing difficulties arising from lower sales, weakening market, and rising production costs in its lead-zinc mining operation in Kabwe (formerly Broken Hill). The company asked the Zambian Government for relief from royalty payments, approximately $1.4 million in 1967, to counteract these problems. By yearend 1967 no decision had been made on this request.

Aware of Kabwes high operation cost, the Mines Workers' Union of Zambia (MUZ) did not press for the 22-percent general wage increase which Copper Belt miners obtained after the release of the Brown Commission report. Kabwe employs about 2,500 people in its operation.

The 10-percent decline in lead-zinc output in 1967 was attributed to a premature shutdown of the smelter for repairs and a shortage of sulfuric acid supplies from the Copper Belt.

In 1966, research was underway into methods for extracting zinc from silicate ores, which would increase annual electrolytic zinc output by about 7,000 tons.

NONMETALS

Cement.—Chilanga Cement Ltd., which has 40 percent Zambian Government participation, continued operation throughout 1967. Zambian production reached a new peak of 300,000 metric tons, apparently after completion of a 100,000-ton-per-year producing unit at the Chilanga plant south of Lusaka, which had been under construction since 1966. In 1967 another cement plant with a 200,000-ton annual capacity was planned to be constructed at Ndola in the Copper Belt.

Gypsum.—Zambia's first gypsum industry at Lochinvar, 193 kilometers southwest of Lusaka, operated by Anglo-American Corp. of South Africa, Ltd., was in full operation during 1967, and production was almost 32 percent greater than in 1966. Estimated reserves of high-grade gypsum at Lochinvar were given at about 1 million metric tons.

Mica.—Small-scale mica production in the Lundazi and Serenje districts, initiated by the British South Africa Co. and continued by the Zambian Government, was abandoned in 1964 because it was not profitable.

MINERAL FUELS

Coal.—The first recorded production of coal in Zambia occurred in 1966. Output was all from the Nkandabwe open pit mine in the Zambezi Valley, operated by an administrative company of which the Zambian Government holds 50 percent and Zambian Anglo-American and RST 25 percent each. Solution of transportation problems by 1967 led to a virtual threefold increase in output.

Preliminary investigations of the Siankondo coal deposit, near Mamba and southwest of Nkandabwe concluded in 1966, indicated that the average thickness of the coal seam was about 18 feet and that reserves were about 50 million tons. Overall proximate analysis of the coal was as follows: Water, 2 percent; ash, 19.5 percent; volatiles, 19.5 percent; fixed carbon, 59 percent; calorific value, 11,300 Btu per pound.

Petroleum.—To overcome the petroleum shortage that Zambia had faced since the Southern Rhodesian Unilateral Declaration of Independence, and to have a somewhat dependable refinery product supply line, the Zambian Government decided in 1966 to build a pipeline from Dar-es-Salaam in Tanzania to Nodala in the Copper Belt. The $44 million contract, awarded to SNAM Progetti, a subsidiary

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of the Italian Ente Nazionale Idrocarburi (ENI), called for construction of 1,760-kilometer, 8-inch pipeline from ENI's 12,000-barrel-per-day Dar-es-Salaam refinery.

The construction work, under the management of Bechtel International Corp., was started, following a loan from the Italian Medio Banca, repayable in 15 annual installments, beginning 1 year after project completion. At yearend 1967, work apparently was on schedule and completion was expected in mid-1968.

The Zambian market of about 4,000 barrels per day was formerly supplied with products from the 20,000-barrel-per-day refinery at Umtali, Southern Rhodesia, which was shut down in January 1965. Since then, products for Zambia have been brought in by air and by road through neighboring countries.

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The Mineral Industry of the Islands of the Caribbean

By Burton E. Ashley [1]

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BARBADOS

Little information is available on the limited mineral industry of Barbados. The island has remained almost wholly dependent upon imports for its mineral commodity requirements although limited amounts of simple construction materials are evidently produced, primarily for local use but also for export. Among imports, petroleum products have been by far the most significant commodity group; these are not only for use in Barbados, but also for a modest bunkering trade and for reexport to nearby islands. Similarly, among nonfuel mineral imports, a portion of total imports are reexported to neighboring islands.

[1] Physical scientist, Division of International Activities.

Table 1.—Barbados: Exports and reexports of mneral commodtes

(Metric tons unless otherwise specified)

Commodity [1]	1965	1966	Principal destinations, 1966
Metals:			
Aluminum, all forms	3	4	United States 1; remainder chiefly to neighboring islands.
Copper, all forms	1	6	Mainly to Antigua.
Iron and steel, semimanufactures	943	1,100	Mainly to neighboring islands in amounts of less than 300 tons.
Lead	65	58	Montserrat 27; Denmark 20.
Scrap:			
Ferrous	------	914	All to Venezuela.
Nonferrous	166	138	Netherlands 52; Denmark 41.
Nonmetals:			
Fertilizer materials	6	39	St. Lucia 36.
Salt	2	4	Netherlands Antilles 3.
Sand, gravel, clay, crushed stone	15,843	7,974	Mainly to Guyana.
Other crude minerals	3	636	Guyana 491; Trindad and Tobago 142.
Mineral fuels: Petroleum refinery products:			
Gasoline---thousand 42-gallon barrels	23	20	Mainly to stores.
Kerosine---do	98	263	Do.
Distillate fuel oil---do	669	880	Do.
Residual fuel oil---do	458	1,522	All to stores.
Lubricating oils---do	1	2	Mainly to stores.
Lubricating greases	5	5	Trinidad and Tobago 4.
Waxes	37	21	St. Lucia 6; Anguilla 4; Grenada 4.
Other	22	835	Guyana 671; stores 107.

[1] Cement, lime, and other minerals under Section 66 are reexported in small quantities.

Source: Government of Barbados. Statistical Service. Overseas Trade. 1965, 361 pp.; 1966, 344 pp.

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Table 2.—Barbados: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum, all forms	109	181	United States 98; United Kingdom 66.
Copper, all forms	8,706	5,921	United Kingdom 4,179; Australia 618.
Iron and steel:			
Pig iron and ferroalloys	13	4	Mainly from United States.
Ingots, blooms, slabs, etc	54	197	Mainly from United Kingdom.
Semimanufactures	7,110	9,126	Do.
Scrap	51	49	Do.
Lead, all forms	114	124	Do.
Tin long tons	231	304	Do.
Zinc	10	3	All from United Kingdom.
Nonmetals:			
Abrasive materials	12	13	Mainly from United Kingdom.
Asbestos materials	1,033	1,110	Do.
Cement	32,241	33,568	Trinidad and Tobago 17,622; Venezuela 12,203.
Clay and clay products	21,023	54,582	Mainly from United Kingdom.
Fertilizers:			
Crude	31	72	Mainly from East Germany.
Manufactured	15,201	16,187	West Germany 6,653; France 3,343.
Lime	134	508	Mainly from United Kingdom.
Salt	2,020	2,134	Do.
Sand	126	27	United States 10; Trinidad and Tobago 9.
Stone:			
Dimension	14	73	St. Vincent 44; Canada 19.
Rough	252	195	Italy 162.
Mineral fuels:			
Charcoal	325	167	Mainly from Guyana.
Coal	497	554	United States 478.
Petroleum:			
Crude thousand 42-gallon barrels and partly refined.	339	689	All from Venezuela.
Refinery products:			
Gasoline do	157	179	Mainly from Trinidad and Tobago.
Kerosine do	187	149	Do.
Distillate fuel oil do	974	812	Mainly from Venezuela.
Residual fuel oil do	1,420	1,438	Do.
Lubricating oils do	10	10	Mainly from United States.
Lubricating greases	117	103	Do.
Waxes	80	93	United States 45; Netherlands 20; West Germany 14.
Other	1,140	704	Mainly from Trinidad and Tobago.

Source: Government of Barbados. Statistical Service. Overseas Trade. 1965, 361 pp.; 1966, 344 pp.

BERMUDA

Output of simple construction materials, Bermuda's only recorded mineral industry product, generally increased in 1967 over 1966 levels, although output of dimension limestone fell to a new low for recent years, totaling only slightly more than one-third of the nearly 61,000 metric tons recorded in 1963. Virtually all requirements for mineral commodities other than those listed as produced in table 3 must be met through imports, chiefly in the form of finished goods. Foremost among mineral commodity imports have been petroleum products (over 1.15 million barrels in 1965), others of significance are cement, iron and steel structural forms, and asbestos sheets. Of the 1965 petroleum imports, over 37 percent on a volume basis was gasoline, over 31 percent was jet fuel, and over 23 percent was kerosine, other products totaling under 9 percent of the total. A significant quantity of petroleum products are reexported as international aviation bunkers.

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Table 3.—Bermuda: Estimated production of mineral commodities

(Metric tons)

Commodity	1963	1964	1965	1966	1967
Nonmetals:					
Lime	120	100	100	20	10
Limestone:					
Crushed	60,963	66,043	43,690	65,027	77,626
Dimension		27,433	29,465	30,482	22,861
Rough		NA	6,096	6,096	6,706
Sand:					
Crushed	NA	NA	30,482	36,578	49,786
Natural	5,080	7,112	40,642	40,642	55,773

NA Not available.

Table 4.—Bermuda: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals: Scrap, unspecified—Value	$54,390	$90,641	All to United States.
Mineral fuels: Petroleum refinery products:			
Gasoline:			
Aviation—thousand 42-gallon barrels	224	65	All to bunkers and commercial.
Other—do	20	22	Do.
Kerosine—do	3	2	Do.
Jet fuel—do	474	588	Do.
Residual fuel oil	26,397	32,227	Do.
Lubricating oil—thousand 42-gallon barrels	7	4	Do.

CUBA

Little new information of assessable reliability concerning the Cuban mineral industry became available during 1966–67. Gleanings of information were found in Cuban domestic and foreign journals and trade publications, reports of speeches by Cuban Government officials, foreign trade statistical publications, and other public sources.

Energy, cement, and fertilizer materials appeared to be the foci for increased production, and various reports indicated some success in attaining goals.

New cement plants were under construction, and active exploration was in progress for increased petroleum supply. The use of asphalt as a fuel was being tested at two industrial plants.

Nickel, cobalt, chromite, manganese, and perhaps iron ore and copper were being produced. In some cases, substantial increases were reported. Recorded output of refined petroleum products from the three refineries has steadily increased over the last 5 years.

One of Cuba's important stocks-in-trade was the readily bartered products from the U.S.-established nickel-cobalt mining and recovery industry. Such commodities remained of great value to the Cuban economy in affording the means to procure many items not available from the Cuban domestic industry.

PRODUCTION

Production statistics have not been generally available since 1964. Considering the construction programs that appear to be in progress, Cuba's output of construction materials can reasonably be assumed to be on the increase. Available figures for 1967 production show substantial increases, which at least in some cases probably required increased production in other areas. Asphalt was reportedly being used as a fuel, and this new use likely increased output over the levels of 1963 and 1964 when more than 49,000 tons per year were produced for standard uses.

Appreciable 1967 increases over 1966 output were indicated for crude petro-

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leum, 64 percent; cobalt in nickel sulfides, 14 percent; chromite, 43 percent; and cement, 12 percent.

Cobalt production figures were arrived at by using a factor of 5 percent of the 20,900 tons of combined nickel-cobalt sulfide output for the Moa Bay plant as reported by the Havana press. Applying a factor of 55 percent gives the approximate recoverable quantity of nickel.

The published figure[2] for total nickel output in 1967 of 26,600 tons, used in combination with Moa Bay output, leaves 15,105 tons that approximated production from the plant at Nicaro.

The 1968 combined nickel-cobalt sulfides production target for the Moa Bay operation, was 26,626 tons.

[2] World Mining. V. 4, No. 3, March 1968, p. 53.

Table 5.—Cuba: Estimated production of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963[1]	1964[1]	1965	1966	1967
Metals:					
Chromite, refractory grade	56,628	32,852	30,000	30,000	43,000
Cobalt, in nickel sulfides	470	700	[3] 800	[r] 915	1,045
Copper, in concentrate	6,523	5,837	6,000	6,000	NA
Iron ore	1,000	1,000	1,000	NA	NA
Iron and steel:					
Castings:					
Iron	8,656	14,418	NA	NA	NA
Steel	1,232	1,948	NA	NA	NA
Pipe and connections	NA	12,787	NA	NA	NA
Welding rods	NA	573	NA	NA	NA
Manganese ore:					
Chemical grade, 81 percent MnO_2	3,300	NA	NA	NA	NA
Metallurgical grade, 35 to 45 percent Mn	[3] 37,504	[3] 70,347	[r] [3] 80,000	75,000	NA
Total	40,804	NA	NA	NA	NA
Nickel:					
In oxide with cobalt, recoverable	14,625	14,712	[3] 18,350	[r] 15,912	15,105
In sulfide, recoverable	5,161	7,703	[3] 9,000	[r] 10,065	11,495
Total	19,786	22,415	[3] 27,350	[r] 25,977	26,600
Nonmetals:					
Cement, portland thousand tons	812	806	801	800	896
Dolomite	NA	1,964	NA	NA	NA
Gypsum	26,707	25,273	NA	NA	NA
Kaolin	5,800	NA	NA	NA	NA
Lime:					
Burned	5,426	4,711	NA	NA	NA
Hydrated	4,672	10,194	NA	NA	NA
Limestone thousand tons	2,100	NA	NA	NA	NA
Marble:					
Block	6,513	9,522	NA	NA	NA
Rough slabs square meters	28,450	47,968	NA	NA	NA
Finished slabs do	18,846	21,245	NA	NA	NA
Pyrite, 48 percent sulfur	33,700	30,000	30,000	30,000	NA
Sulfur content	15,200	13,500	13,500	13,500	NA
Salt	90,000	87,000	106,000	100,000	NA
Sand:					
Silica cubic meters	397,184	422,561	NA	NA	NA
Other do	420,454	389,590	NA	NA	NA
Sodium hydroxide	1,259	1,396	NA	NA	NA
Sodium sulfate	1,602	1,536	NA	NA	NA
Stone cubic meters	431,740	425,410	NA	NA	NA
Minerals fuels:					
Asphalt	49,489	49,112	NA	NA	NA
Gas, manufactured million cubic feet	2,260	10,455	NA	NA	NA
Petroleum:					
Crude thousand 42-gallon barrels	[r] 205	[r] 248	[r] 382	[r] 460	756
Refinery products:					
Gasoline do	6,605	6,392	NA	NA	NA
Kerosine do	1,186	1,387	NA	NA	NA
Distillate fuel oil do	3,611	3,447	NA	NA	NA
Residual fuel oil do	14,799	13,007	NA	NA	NA
Lubricants do	259	378	NA	NA	NA
Liquefied petroleum gas do	534	545	NA	NA	NA

[r] Revised. NA Not available.

[1] Junta Central de Planificación (JUCEPLAN), Dirección General de Estadística. Boletín Estadística de Cuba. Havana. 1965.

[2] Based on official data for 6 months.

[3] Reported as sinter.

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TRADE

Cuba carried on mineral commodity trade with many countries, but the larger part appeared to be with the Soviet Union. In 1965, Cuba's total commodity exports to the Soviet Union were valued at 308 million rubles, including 25.8 million rubles' worth of metal ores and concentrates. In 1966, total commodity exports to the Soviet Union were valued at 257.3 million rubles, including 24.2 million rubles' worth, or 9.4 percent, of metal ores and concentrates.

Selected exports of mineral commodities from the U.S.S.R. to Cuba in 1965 were valued at 89.1 million rubles and in 1966 at 104.4 million rubles.

Table 6.—U.S.S.R. mineral commodity exports to Cuba

(Metric tons unless otherwise specified)

Commodity	1965		1966	
	Quanitty	Value (thousand rubles)	Quanity	Value (thousand rubles)
Metals:				
Aluminum and alloys, all forms	4,300	3,028	4,100	2,841
Copper and alloys, all forms	5,100	4,848	4,700	4,776
Iron and steel:				
Pig iron	32,300	1,261	42,200	1,538
Ferroalloys	1,300	136	1,400	131
Semimanufactures:				
Pipe	24,100	3,737	24,100	3,826
Tinplate	24,100	5,240	26,900	5,595
Other rolled steel	81,000	9,728	142,900	15,115
Lead	700	286	100	324
Zinc	200	80	500	158
Nonmetals:				
Asbestos	2,800	353	6,000	741
Cement	56,000	445	162,000	1,630
Fertilizer:				
Nitrogenous	226,900	8,426	222,900	9,064
Superphosphate	51,600	925	105,600	2,007
Potassic	59,200	1,125	101,400	2,301
Refractory materials	1,600	114	5,000	373
Sulfur	55,500	1,337	76,800	2,786
Mineral fuels:				
Coke, thousand tons	31	659	26	529
Petroleum, crude, do.	3,513	36,948	3,840	39,729
Petroleum refinery products:				
Gasoline, do.	133	3,167	100	2,610
Distillate fuel oil, do.	208	3,864	247	4,167
Residual fuel oil, do.	811	7,381	826	7,535
Lubricants, including greases, do.	61	4,211	75	5,436
Paraffin	1,800	251	1,900	256
Carbon black	-------	---------	89,124	104,404

Source: Vneshnyaya Torgovlya S.S.S.R. za 1966 god (Foreign Trade of the U.S.S.R. for 1966).

In 1966, Yugoslavia reportedly supplied to Cuba 283 tons of aluminum sheets, 1 ton of aluminum foil, 94 tons of copper tubing, 1,207 tons of coated wire (not further described), 225 tons of uncoated wire (not further described) and 280 tons of bentonite.

The following tabulation lists Polish-Cuban trade in mineral commodities for 1965 and 1966 in metric tons. In 1966 the dollar value of trade, in both directions, increased substantially over that of 1965 value.

Commodity	1965	1966
Imports from Cuba:		
Value (million US$)	$4.3	$13.4
Chrome ore, metric tons	4,223	22,703
Copper concentrates, do.	4,410	3,518
Manganese ore, do.	45,807	2,691
Other nonferrous metal concentrates, do.	299	290
Exports to Cuba:		
Value (million US$)	$5.25	$7.8
Cement, metric tons	------	10,000
Coal, do.	9,000	---------
Coke, do.	5,000	8,000
Petroleum products, do.	60	397
Salt, do.	5,000	---------
Steel sheets, do.	398	275

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It was announced in early 1968 that under an agreement with Spain, Cuba was going to exchange 300 tons of nickel, 100,000 tons of sugar, and 2,500 tons of coffee for fishing boats, tractors, and miscellaneous agricultural machinery.

An agreement was also made with Rumania under which it will furnish oil well drilling and producing equipment in exchange for Cuban products including nickel sinter.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—The 5,000-ton-per-year Fabric Auilar Noriega steel foundry at Santa Clara, Las Villas, was put into operation at yearend 1966. The plant was equipped with machinery from Poland.

In 1966, a program of modernization, mechanization, and expansion was in progress at the José Marti steelworks near Havana. The work at this plant, formerly known as La Antillana de Acero, was being done under a technical and economic cooperation agreement with the U.S.S.R. Mechanization of the rolling process from the ingot form onward appeared to be the main purpose of the work. Reportedly, the rolling mill will be equipped to produce plates up to 300 feet long.

A scrap metal drive to clean up Matanzas Province afforded more than 10,000 tons of metal for the José Marti plant operations.

Nonmetals.—*Cement.*—Cuba reportedly was programing for annual cement output exceeding 2 million tons by 1970; a great effort was being made to complete new plants and increase capacity of those already operating.

East Germany was helping to build the "26th of July" cement plant in the Nuevitas Bay area in Camaguey, close to necessary basic raw material reserves adequate for more than 100 years' operation. Scheduled to be operating in 1968, original planned capacity was 400,000 tons per year with eventual expansion to 600,000 tons annually.

As Siguaney, Las Villas, equipment from Czechoslovakia was being used to build a cement plant with planned capacity of 670,000 tons annually. The José Merceron cement plant in Santiago reportedly increased output by 66 percent after expansion and repairs. Annual capacity was not available. The Rene Arcay cement plant, at Mariel, Pinar del Rio, produced its 1967 quota of 350,000 tons of cement.

Fertilizer Materials.—July 1967, plans for construction of two fertilizer plants were announced. A contract with the U.S.S.R. called for a plant to produce 135,000 tons of urea and 200,000 tons of complete fertilizer annually. A contract negotiated with Great Britain called for a plant with annual productive capability of 285,000 tons of ammonium nitrate and 180,000 tons of urea.

A plant was also reported under construction in Cienfuegos to produce 400,000 tons of nitrogenous fertilizer, 220,000 tons of ammonium nitrate, and 89,000 tons of urea annually. Cost was calculated at 90 million pesos.

Salt.—The El Real salt works at Nuevitas, Camaguey, reportedly produced 30,000 tons of salt in 1967, 5,000 tons more than was originally planned.

The Caimanera and Cerro Guayabo salt works in Oriente Province were to be expanded by 14 million square meters. The production goal for 1971 was set for 150,000 tons.

Mineral Fuels.—*Asphalt.*—A study was in progress to determine whether domestic asphalt could be substituted as a fuel for petroleum in the Ariguanabo textile mill and the Papelera Moderna plant in Havana. It was reported that preliminary work was underway to produce 500,000 tons of asphalt annually.

A 1943 research study indicated that Cuban asphalts could be used as fuel, but the high ash content was a problem that required some consideration and caused the cost of such fuel to be of borderline economic value. However, because of the critical shortage of fuel in Cuba, it was likely that a higher domestic operating cost with indigenous fuel would be more than offset by foreign exchange savings.

Petroleum.—Progress toward increasing Cuba's domestic crude oil supply was made with the finding of oil at Guanabo, about 25 kilometers east of Havana. The discovery well encountered oil at a depth of 875 meters (2,871 feet) and flowed 206 tons (1,370 barrels) in the first 9 hours. (Converted at the rate of 6.652 barrels equals 1 ton).

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The well was out of control for a time, and it is doubtful if the indicated potential could be sustained with the introduction of optimum production practice.

Three wells were completed at Guanabo, and others were being drilled. The three wells in production were believed to be averaging about 700 barrels per day, with the largest reportedly at slightly more than 900 barrels per day. An intimation that the Guanabo field might not be of great extent was made in one report that expressed the idea that 12 wells were too many to be hoped for.

New high-pressure gas wells were reportedly found near Majagua; a natural gas pipeline from the field was supplying the Vicente thermoelectric powerplant in Ciego de Avila.

At yearend 1967, it was reported that some 220 wells, in Cuba produced 105,000 metric tons (735,000 barrels)[3] of oil, a new national record. Credit for the increase was given to the discovery of a new sedimentary producing horizon at Jatibonico, Camaguey. It was estimated that domestic production satisfied 2.3 percent of total needs. Estimated national production for 1968 was put at 115,000 tons.

At yearend 1967, the Nico Lopez refinery required repair and for a time necessitated gasoline rationing in Havana. Delivery of liquefied petroleum gas in and around Havana was also interrupted.

Oil exploration and development continued with equipment and technical help from the U.S.S.R. and Rumania. A Cuban-Rumanian agreement was concluded which provided 30 million Cuban pesos credit against oil well drilling equipment. Repayment was to be made over 8 years starting 1 year after delivery of various items, and was to be in the form of Cuban products including 2,000 tons of nickel.

The following figures on costs and consumption were taken from Havana news media. In rounded numbers, 6 tons of oil from the U.S.S.R. costs 1 ton of sugar. Presumably in 1967, 810,000 tons of sugar were expended for 4,860,000 tons of oil.

The following tabulation shows 1967 consumption of petroleum products:

Product	Consumption (thousand tons)
	1967
Gasoline	909
Kerosine	285
Fuel oil:	
Distillate	937
Residual	2,736

DOMINICAN REPUBLIC

Mining in the Dominican Republic continued to be of minor importance in 1967, contributing only about 1 percent by value of the Gross Domestic Product.

Mitsubishi Metal Mining Co. Ltd. reportedly intended to pursue its preliminary copper survey in the Cordillera Central with a core drilling program. Falconbridge Nickel Mines, Ltd. continued pilot plant operation on its nickel project and announced plans to go into full-scale production.

Other activities in 1967 could lead to production of alumina, iron ore, and manganese and increased output of salt.

Regarding proposed mining legislation, a new preliminary draft was being prepared. Law No. 193 of October 3, 1967, established the National Marble and Travertine Commission to promote the mining and marketing of those commodities.

The Government apparently did little to encourage mineral development except to allow entry of foreign firms and capital for exploration and development.

The Pan American Union published[4] a three-volume work dealing with the natural resources of the Dominican Republic prepared by technicians provided by the Economic Affairs and Technical Cooperation Departments of the Organization of American States (OAS). Volume 1 deals with all aspects of the various natural resources and, in addition, suggests programs for the development, use, and conservation of the country's resources. Volume 2 consists of 11 maps showing, among other things, geology, geomorphology, distribution of soil types, and transportation. Vol-

[3] Note that Cuban sources convert at 7 barrels equals 1 ton.

[4] Pan American Union. Reconocimiento y Evaluación de los Recursos Naturales de la República Dominicana. (Survey and Evaluation of the Natural Resources of the Dominican Republic). Washington, D.C. 1967, v. 1, 540 pp.; v. 2, 11 maps; v. 3, 169 pp.

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ume 3, describes the soil types found in the Dominican Republic.

The geological map (scale, 1:250,000), largely compiled from past work done by various geologists, and filled in by field reconnaissance done by the OAS team, should be extremely valuable as a base for further exploration and refinement.

The report recommends that among the first things that must be done to encourage mineral development is to change the present law to require that a vigorous exploration program be carried on by concession holders. It was also recommended that the Department of Mines be strengthened with technicians so that it can provide closer administration of mining laws and regulations.

PRODUCTION

In 1967, output of copper and nickel were added to the production table as a result of previous successful exploration and experimental work. It was expected that nickel output would continue on an expanded basis, but future production of copper ore was not assured.

Cement output gained slightly over 12 percent, with a concomitant gain in gypsum production. Limestone production was unreported.

Bauxite production bettered the million-ton level, and shipments were 18 percent greater than in 1966.

No one particular agency of the Dominican Republic Government collects mineral production figures on a current basis; therefore, data have been gathered from a number of sources. Thus, gaps in figures obtained from year to year are to be expected, as are incomplete returns in some commodities.

Table 7.—Dominican Republic: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Bauxite, dry equivalent, shipments	773,088	760,290	941,756	833,008	983,043
Copper ore	-------	---------	---------	---------	1,200
Nickel:					
Ore	-------	---------	---------	NA	30,000
Ferronickel	-------	---------	---------	NA	75
Nonmetals:					
Amber—kilograms	[1] 261	[1] 320	[e] 300	NA	2,282
Cement	229,135	297,515	211,974	276,398	310,120
Clays	[e] 12,000	[e] 12,000	NA	NA	5,449
Fertilizers, chemical	[e] 50,000	[e] 50,000	NA	NA	NA
Gravel and crushed rock-cubic meters	[e] 50,000	[e] 50,000	NA	NA	NA
Gypsum	35,318	109,694	89,499	90,883	118,710
Lime	8,526	NA	NA	NA	NA
Limestone	310,000	398,470	[2] 271,667	[2] 359,317	NA
Salt:					
Marine—thousand tons	10	29	26	[e] 25	NA
Mined—do	23	2	21	[e] 20	([3])
Total—do	33	31	47	[e] 45	NA
Sand	NA	NA	[4] 46,674	NA	[5] 5,464
Stone, dimension and crushed:					
Granite	NA	NA	NA	NA	931
Marble and travertine	NA	([6])	NA	NA	33

[e] Estimate. NA Not available.
[1] Exports.
[2] For cement only.
[3] Less than ½ unit.
[4] Domestic consumption of national production.
[5] Glass sand only.
[6] Production of quarried slabs reported as 3,757 square meters of marble, and 3,757 square meters of travertine.

TRADE

Bauxite is by far the most valuable mineral export, and in 1967 such exports were valued at $10.2 million, or nearly 7.5 percent of all commodity exports.

Mineral commodity imports in 1966 gained considerably in value over the 1965 level. Among the more important gains registered for 1966 were iron and steel construction shapes, up 158 percent, and cement, up 162 percent.

In respect of total commodity trade for

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1966, the United States was the Dominican Republic's most important trading partner in terms of value, accounting for 87.2 percent of total commodity exports and 46.1 percent of all commodity imports. In 1966, the Dominican Republic's second and third most valuable sources of imports were Japan and West Germany; Spain and Belgium were the second and third most important destinations for commodity exports.

The following tabulation shows the value of total trade in relation to trade in mineral commodities for 1965 and 1966:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	11,775	125,503	9.4
1966	10,346	136,717	7.6
Imports:			
1965	14,878	86,749	17.1
1966	19,614	160,754	12.2
Trade balance:			
1965	−3,103	38,754	XX
1966	−9,268	−24,037	XX

XX Not applicable.

Table 8.—Dominican Republic: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum ore: Bauxite	1,139,375	1,001,280	Mainly to United States.
Iron and steel scrap	645	749	Do.
Nonmetals:			
Cement	4,824	15,995	Virgin Islands 8,633; Leeward Islands 2,685.
Clay products:			
Brick	148	163	Mainly to Puerto Rico.
Roofing tile	15	33	All to Puerto Rico.
Gypsum	54,225	73,350	Mainly to Puerto Rico.
Salt	100	100	All to Panama.
Sand	11	--------	
Stone, dimension:			
Granite	30	105	All to Puerto Rico.
Marble	5	1	Mainly to Puerto Rico.
Mineral fuels:			
Coal	4	3	All to Virgin Islands.
Petroleum refinery products, lubricating oils.	--------	6	All to Haiti.

Source: República Dominicana, Oficína Nacional de Estadística. Comercio Exterior 1966 V. 14, 1967, 292 pp.

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Table 9.—Dominican Republic: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Copper and its alloys, and manufactures.	464	717	Canada 257; United States 174; West Germany 82.
Gold, silver, platinum and their manufactures. kilograms	257	663	Mainly from United States.
Iron and steel products:			
Construction materials:			
Large pieces	3,507	7,483	Belgium 4,429; United States 1,476; West Germany 587.
Galvanized sheet	1,008	7,386	Japan 5,779; Belgium 658.
Other	7,693	16,677	Belgium 11,718; West Germany 3,065.
Total	12,208	31,546	
Rails and railway material	319	82	United States 69; Netherlands 13.
Pipes and fittings	1,154	3,400	United Kingdom 1,000; United States 908; West Germany 659.
Wire, smooth	2,769	4,388	Belgium 2,248; West Germany 1,234.
Tin, lead, zinc, and other metals and metal manufactures.	601	1,602	United States 709; West Germany 269; Canada 248.
Nonmetals:			
Cement	1,350	3,536	United Kingdom 1,580; Japan 876; West Germany 654.
Ceramics: China, porcelain, pottery	1,989	4,088	Japan 2,216; United States 1,033.
Stone, earth and their manufactures	1,351	1,528	Canada 685; United States 315.
Mineral fuels:			
Coal, coke, and briquets	154	990	United States 370; Netherlands 345; West Germany 248.
Petroleum products:			
Gasoline. thousand 42-gallon barrels	619	1,442	Netherlands Antilles 813; Jamaica 338; Trinidad and Tobago 290.
Kerosine do	82	222	Netherlands Antilles 140; Trinidad and Tobago 51.
Fuel oil do	1,951	1,982	Netherlands Antilles 831; Venezuela 740.
Lubricating oil	9,453	8,988	United States 5,105; Jamaica 1,871; Netherlands Antilles 1,665.
Other	15,177	12,773	Venezuela 6,041; Jamaica 2,593; United States 2,554.

Source: República Dominicana, Oficina Nacional de Estadística. Comercio Exterior, 1966. V. 14, 1967, 292 pp.

COMMODITY REVIEW

Metals.—*Bauxite.*—Under its contract with Aluminum Company of America, the Dominican Republic has the right to acquire 850,000 tons of bauxite annually from the company for a term of 15 years. The Government indicated some interest in building an alumina plant, and full feasibility studies were contemplated.

Nickel.—Falconbridge Nickel Mines Ltd., announced plans to invest $150 million in a plant to produce more than 50 million pounds of nickel annually, presumably as ferronickel. Its property contains not less than 62 million tons of ore averaging 1.55 percent nickel. The known ore body, to be mined by open-pit methods, generally is about 30 feet thick, but ranges up to 180 feet in thickness.

Minera y Beneficiadora Falconbridge Dominicana C. por A., the Falconbridge subsidiary, recorded pilot plant output in 1967 of 75 tons of ferronickel containing 45.5 percent nickel.

It was announced in the Santo Domingo press that the Government of the Dominican Republic would attempt to renegotiate Falconbridge's contract to the greater benefit of the State. Some local opinion was expressed to the effect that renegotiation would not be in the best interests of attracting foreign capital.

Nonmetals. — *Salt.* — Pittsburgh Plate Glass Co. contracted to make a study of the Barahona salt mine as a possible salt source for its Puerto Rico chlorine and caustic soda plant. Initial annual plant requirements of salt were estimated at 300,000 tons eventually rising to 600,000 tons.

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HAITI

Little information has been released on the activities of the Haitian mineral industry in 1966 and 1967, but production of dried bauxite and of copper ore, the nation's leading mine products, declined in 1967 and the country's cement output, although slightly higher than in 1966, fell considerably short of the 56,000 tons produced in 1964. No data on mineral trade are available for years subsequent to 1965; in that year although increases were recorded in a number of minor commodities, overall trade volume in mineral commodities was lower than in 1964 as a result of appreciable declines in steel and petroleum product imports.

A report released in 1967 [5] indicated that Reynolds Haitian Mines, the country's bauxite producer, stepped up crude mine output from 400,000 tons in 1965 to 500,000 tons in 1966, but recorded output of dried bauxite does not reflect such an expansion. The same source indicated that this expansion and further expansion planned for 1967 and 1968 was intended to bring output up to the 750,000-ton-per-year loading capacity of facilities at Miragoane.

[5] Mining Journal (London). Mining Annual Review. May 1967, p. 213.

Table 10.—Haiti: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Aluminum ore: Bauxite, dried	384,000	437,160	382,588	361,426	359,192
Products of copper mining:					
Ore milled	254,478	241,189	212,934	198,444	166,690
Concentrate produced	16,181	12,655	10,223	9,069	6,766
Content of concentrate:					
Copper	5,884	5,029	3,960	r2,780	2,350
Gold—troy ounces	6,778	8,090	6,719	5,071	NA
Silver—do.	107,022	92,057	77,488	50,690	NA
Nonmetals: Cement—thousand tons	50	56	42	38	40

r Revised. NA Not available.

[1] Clay, gravel, lime, limestone, marble, sand, and salt are also produced in Haiti; neither statistics nor reliable estimates are available for quantity of such output.

Table 11.—Haiti: Exports of mineral commodities

(Metric tons)

Commodity	1964	1965	Principal destinations, 1965
Metals:			
Aluminum ore: Bauxite	457,655	427,799	All to United States.
Copper:			
Concentrate	15,045	10,221	Japan 7,272; Spain 2,949.
Scrap	-------	127	Germany 55; United Kingdom 43.
Iron: Scrap	80	211	Germany 201.
Nonmetals: Cement	-------	81	All to Martinique.

Note: Source does not distinguish between East and West Germany.

Source: Government of Haiti. Rapport Annuel de L'Administration Generale des Douanes pour l'Exercise Octobre 1964–Septembre 1965, 125 pp.

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Table 12.—Haiti: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal sources, 1965
Metals:			
Aluminum, including alloys, all forms	88	129	Italy 77; United States 33.
Copper, including alloys, all forms	10	23	Mainly from United States.
Iron and steel:			
Iron ore and concentrate	2	2	Do.
Pig iron, sponge iron, ferroalloy and steel powders.	100	41	Mainly from Belgium.
Ingots and other primary forms	101	1	Mainly from Germany.
Semimanufactures	6,981	6,024	Mainly from Belgium.
Lead, including alloys, all forms	2	(1)	
Platinum and platinum group metals, unworked or partly worked. troy ounces	579	836	Mainly from United States.
Silver, unworked or partly worked. do	322	804	Mainly from Germany.
Tin, including alloys, all forms. long tons	80	174	Mainly from United States.
Zinc, including alloys and semimanufactures.	14	1	Mainly from Belgium.
Nonferrous metals, ore and concentrate, not specified.	3	(1)	
Nonmetals:			
Abrasives, natural, including industrial diamond. kilograms	226	682	Mainly from United States.
Asbestos cement building materials	200	217	Belgium 212.
Cement, not further specified	258	346	Denmark 111; France 106.
Clay and similar refractory materials	63	58	Germany 42.
Clay products, nonrefractory	132	66	Czechoslovakia 22; Japan 19.
Fertilizer materials:			
Nitrogenous	6	----	
Phosphatic	46	5	All from United States.
Potassic	25	26	Italy 16.
Gem stones kilograms	8	NA	
Graphite do	99	(1)	
Lime	2	----	
Mica, worked kilograms	----	260	Mainly from United States.
Refractory bricks and similar products	55	56	Do.
Salt	71	80	United States 50; Canada 28.
Sodium carbonate (soda ash)	40	46	France 30; United States 15.
Stone, sand and gravel	3	6	All from United States.
Sulfur	3	----	
Other, not specified	11	44	Mainly from United States.
Mineral fuels:			
Coal and coke	75	50	Mainly from Germany.
Asphalt, natural	52	138	Venezuela 55; United States 51.
Mineral tar and crude chemicals from coal, petroleum and natural gas.	8	(1)	
Petroleum:			
Crude and partly refined	44	----	
Gasoline 42-gallon barrels	270,590	62,893	Mainly from Curacao.
Kerosine do	27,510	3,407	Do.
Fuel oils	51,360	36,627	Do.
Lubricants	1,263	1,396	Mainly from United States.
Paraffin and vaseline	256	147	United States 67; Netherlands 48.
Other [2]	40	20	Mainly from United States.

NA Not available.
[1] Less than ½ unit.
[2] May include some products derived from coal and natural gas.
Note: Haiti trade returns do not differentiate East and West Germany.

Source: Government of Haiti. Rapport Annuel de L'Administration Generale des Douanes pour l'Exercise Octobre 1964—Septembre 1965, 125 pp.

JAMAICA

The Jamaican economy in 1967 eased from its previously strong pace as growth of mineral output, tourism, and agricultural production slowed, the latter as a result of prolonged drought. The growth rate level of around 7 percent sustained between 1963 and 1966 declined to about 4 percent at current prices.

The bauxite/alumina industry provided about 8.5 percent of the gross domestic product in 1967, and afforded the country over $100 million in export value. Although large increases were not recorded in the bauxite mining sector, planned ex-

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pansion in mining and alumina processing plants indicate that the industry will grow in volume and value. It was estimated that with the completion of present expansion plans, alumina output could reach 3 million tons per year by 1976.

One of the more serious social and economic situations in Jamaica was the estimated 15-percent unemployment level. Countering the Jamaican Government's desire to attract foreign investment is the rivalry displayed by the two major industrial labor unions. Some violence and interruption of work was experienced by the bauxite industry in 1967.

PRODUCTION

Bauxite is the only metallic mineral raw material of record produced in Jamaica. Bauxite produced for export (dry equivalent) rose by 1.7 percent over the preceding year, and that converted to alumina rose by 4.2 percent.

The leveling off of construction activity in 1967 was the likely reason for the 5.7 percent decrease in cement output. Stocks of gypsum at yearend 1967 were declared at 378,660 tons.

Table 13.—Jamaica: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Bauxite, dry equivalent:					
Produced for export	5,244,391	6,062,894	6,893,353	7,132,281	7,257,052
Converted to alumina	1,769,519	1,873,574	1,757,668	1,929,237	2,010,640
Cement grade	---	---	48,293	76,094	124,314
Total	7,013,910	7,936,468	8,699,314	9,137,612	9,392,006
Alumina (exports)	737,193	780,656	732,361	803,849	837,787
Nonmetals:					
Cement, common portland	200,721	281,339	312,582	355,434	335,297
Clays, for cement	NA	55,221	95,684	125,894	NA
Gypsum thousand tons	r 232	195	212	r 198	167
Limestone	NA	4,300,656	[1] 429,058	[1] 529,747	e [1] 480,000
Marble, cut and/or polished	NA	136,623	NA	NA	NA
Phosphates	14	NA	NA	---	---
Sand and gravel:					
Common sand	NA	273,000	310,428	NA	[2] 1,000,000
Glass sand	5,011	10,474	7,301	8,636	NA
Gravel, natural	NA	668,400	790,214	NA	[2] 325,000
Mineral fuels: Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	---	1,033	1,614	2,008	1,542
Kerosine [3] do	---	528	993	1,113	819
Distillate fuel oil do	---	1,208	1,777	1,905	4,647
Residual fuel oil do	---	3,852	4,561	4,400	
Liquefied petroleum gases do	---	55	97	122	NA
Asphalt do	---	24	54	129	NA
Other do	---	NA	247	3	356

e Estimate. r Revised.
NA Not available.
[1] For cement production only.
[2] Cubic yards, estimated.
[3] May include jet fuel.

TRADE

With 1966 exports of bauxite and alumina valued at $105.7 million,[6] these two commodities represented 47.1 percent of total Jamaican exports for the period. Crude petroleum, at $19.6 million, was the most costly mineral import; in addition, blending agent imports were valued at nearly $2 million.

In terms of value, the United States was Jamaica's foremost trading partner, having supplied, in 1966, $119.4 million worth (36.5 percent) of total commodity imports. The United Kingdom and Canada were the next most important suppliers with 22.2 and 10.9 percent, respectively.

Exports valued at $85.5 million were

[6] The Jamaican Government assigns arbitrary values, per ton, of $6.44 to bauxite, and $67.76 to alumina.

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directed to the United States. Of this total for all goods, bauxite and alumina accounted for $57.6 million. The United Kingdom and Canada were Jamaica's next best customers with 26.5 and 15.3 percent, by value, respectively, of all exports.

The following tabulation shows the relation of trade in mineral commodities to total trade for 1965 and 1966:

	Value (thousand dollars) [1]		Mineral commodities' total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	108,983	209,823	51.9
1966	117,274	224,305	52.3
Imports:			
1965	61,314	289,058	21.2
1966	63,539	327,189	19.4
Trade balance:			
1965	47,669	−79,235	XX
1966	53,735	−102,884	XX

XX Not applicable.
[1] Values have been converted at the rate of J£1 = US $2.80.

Table 14.—Jamaica: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Domestic products:			
Aluminum:			
Bauxite	6,893,350	7,132,280	All to United States.
Alumina	732,165	803,381	Canada 407,271; Norway 225,370; United States 89,966.
Metal and alloys, semimanufactures.	23	33	Mainly to Guyana.
Iron and steel: Scrap	1,034	150	Mainly to United States.
Nonferrous metal scrap	909	1,886	Netherland 889; West Germany 604.
Reexports:			
Iron and steel:			
Ingots and equivalent forms	73	64	Mainly to Cayman Islands.
Semimanufactures	6	101	United Kingdom 50; Cayman Islands 28.
Nonferrous metals:			
Unwrought	2	(1)	
Semimanufactures	28	28	West Germany 10; United Kingdom 7.
Nonmetals:			
Domestic products:			
Cement:			
Portland	51,220	59,012	Bahamas 20,881; Guyana 9,653; British Honduras 4,877.
Other n.e.s	47,346	76,042	All to Bahamas.
Clay and clay products: Brick and tile.	118	5	Cayman Islands 4.
Fertilizer materials, not further specified.	103	2	All to Cayman Islands.
Sand, gravel, crushed rock	195,831	213,305	All to United States.
Stone, dimension	49	64	Do.
Reexports:			
Fertilizer materials	2	5	All to Cayman Islands.
Salt	-------	23	Do.
Other, n.e.s.	20	(1)	
Mineral fuels: Petroleum refinery products:			
Gasoline---thousand 42-gallon barrels	661	990	Dominican Republic 298; Bahamas 211; Haiti 161.
Kerosine---do	166	167	Honduras 45; Puerto Rico 41; British Honduras 35.
Distillate fuel oil	r 91,607	84,499	Honduras 18,060; Bahamas 15,318; Bermuda 15,299; Haiti 13,514.
Fuel oil, other	r 29,739	17,830	West Germany 6,849; United Kingdom 3,512; United States 2,392.
Lubricating oil—thousand 42-gallon barrels	79	130	Guadeloupe 14; Dominican Republic 13; Guyana 13.
Lubricating greases	r 404	979	Dominican Republic 208; Costa Rica 134; Surinam 104.

r Revised.
[1] Less than ½ unit.

Source: Department of Statistics, Jamaica. External Trade of Jamaica. 1965, 269 pp., 1966, 319 pp.

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Table 15.—Jamaica: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum: Metal, including alloys, all forms.	2,093	2,711	Canada 1,144; United States 701; United Kingdom 581.
Copper:			
Sulfate---kilograms	1,500	(1)	
Metal, including alloys, all forms	187	270	United Kingdom 186; United States 45.
Iron and steel:			
Scrap iron and steel	-------	25	All from United Kingdom.
Pig and sponge iron	242	361	United Kingdom 152; Canada 83.
Ingots and equivalent primary forms.	1,265	441	United States 214; Netherlands 102.
Semimanufactures, including castings and forgings.	83,907	90,742	Mainly from United Kingdom.
Lead, including alloys:			
Unwrought	114	48	Canada 32.
Semimanufactures	94	84	Mainly from United States.
Nickel, including alloys, all forms. kilograms	2,000	1,778	Canada 914; United States 508.
Platinum and platinum group metals unworked and partly worked. value	$6,476	$4,522	Mainly from United States.
Silver, unworked and partly worked. do	$5,872	$11,830	Canada $6,350; United Kingdom $4,701.
Tin, including alloy and solder:			
Unwrought---long tons	14	31	Mainly from United Kingdom.
Other semimanufactures---do	679	342	United States 290.
Zinc, including alloys, all forms	41	1	All from United Kingdom.
Other	-------	23	Belgium 12; United Kingdom 7.
Nonmetals:			
Abrasives, natural, including industrial diamond.	4	62	United States 30; United Kingdom 22.
Asbestos:			
Crude fiber	356	185	Mainly from Canada.
Building materials	2,904	1,983	Italy 1,008; United States 611.
Cement:			
Portland	1,918	1,921	United Kingdom 996; Denmark 621.
Refractory	210	169	Mainly from United Kingdom.
Other	26	231	Mainly from United States.
Clay and clay products:			
Clay, not further specified	1,094	3,427	Mainly from United Kingdom.
Brick, tile, pipe, and similar products	1,244	1,187	Do.
Fertilizers, mineral and chemical:			
Nitrogenous:			
Ammonium sulfate	23,560	14,595	United Kingdom 5,716; Trinidad and Tobago 5,535.
Other	3,665	7,102	Mainly from West Germany.
Phosphatic:			
Natural phosphates	36	20	All from United States.
Superphosphates, Thomas slag, other manufactured phosphates.	3,366	2,364	Mainly from United States.
Potassic:			
Potash salts	6,424	8,274	United States 4,269; West Germany 2,303.
Other, not specified	321	197	France 163.
Mixed and other, nonspecified	24,941	31,728	Netherlands Antilles 16,452; Netherlands 6,310.
Gem stones, including diamond:			
Uncut---value	$490	-------	
Cut, unset---do	$11,379	$26,670	Canada $8,366; United States $6,182; Guyana $3,326.
Graphite, natural---kilograms	8,000	7,474	Netherlands 4,990.
Gypsum, limestone, other industrial stone.	135	448	United Kingdom 278; United States 164.
Magnesite	23	(1)	
Mica:			
Sheet, block, scrap, or ground. kilograms	104,000	102,412	Norway 94,875; United States 7,529.
Manufactures---do	-------	(1)	
Refractory brick and similar products	4,627	4,017	United States 2,516; United Kingdom 893.
Salt	11,221	11,640	United Kingdom 7,572; Canada 3,513.
Sand, gravel, crushed rock	1,323	1,847	Belgium 1,074; United States 428.
Sodium carbonate (soda ash)	1,982	2,061	Mainly from United States.
Sodium hydroxide (caustic soda)	60,299	63,271	Do.
Stone, dimension	516	648	Italy 338; United States 147.
Sulfur	1,022	1,025	Mainly from United States.
Other	503	710	Mainly from United Kingdom.

See footnotes at end of table.

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Table 15.—Jamaica: Imports of mineral commodities—Continued
(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Minerals fuels:			
Coal	62	48	Mainly from United Kingdom.
Coke	1,325	525	Mainly from West Germany.
Briquets of coal, coke, lignite, or peat	24	219	Do.
Gases, liquefied	168	238	Mainly from United States.
Petroleum:			
Crude thousand 42-gallon barrels and partly refined.	r 8,582	9,295	Mainly from Venezuela.
Refinery products:			
Gasoline:			
Aviation ---do	61	84	Mainly from Netherlands Antilles.
Motor ---do	7	(1)	
Other ---do	r 764	673	All from Netherlands Antilles.
Kerosine ---do	12	43	Mainly from Netherlands Antilles.
Distillate fuel oil [2]	31,827	16,090	Do.
Residual fuel oil [2]	48,229	129,932	Do.
Lubricating oil. thousand 42-gallon barrels	46	62	Do.
Lubricating grease	412	345	United States 251; United Kingdom 93.
Other thousand 42-gallon barrels	1		
Asphalt	537	1,763	Trinidad and Tobago 983; Netherlands 579.
Natural asphalt	2,014	805	All from Trinidad and Tobago.
Mineral tar and crude chemicals from coal, petroleum, and natural gas.	145	2,437	Mainly from Trinidad and Tobago.

r Revised.
[1] Less than ½ unit.
[2] Mostly bunkers.
Source: Department of Statistics, Jamaica. External Trade of Jamaica, 1965, 269 pp; 1966, 319 pp.

COMMODITY REVIEW

Metals.—*Alumina and Bauxite.*—During 1967 Alumina Partners of Jamaica, Ltd. (ALUPART), continued construction of its alumina plant, near Nain, in St. Elizabeth Parish. Plans were for an initial annual capacity of about 860,000 tons of alumina by 1969, and provided for expansion to over 1 million tons per year. ALUPART is a consortium of Reynolds Jamaica Alumina, Ltd., Kaiser Jamaica Corp, and Anaconda Jamaica, Ltd. The consortium planned to acquire all facilities, property and licenses owned by Kaiser Bauxite Co. in St. Elizabeth and Manchester Parishes, as well as bauxite deposits owned by Reynolds in those same parishes. Kaiser was to manage the project for the first 12 years.

Early 1967 brought reports that Alcoa Mining of Jamaica, a subsidiary of Aluminum Company of America, planned to build an alumina plant in Jamaica, with planned annual capacity of 200,000 tons possibly expandable to 800,000 tons. To supply the projected alumina facility, Alcoa has been given prospecting licenses over various areas to find bauxite of suitable grade.

Reynolds Jamaica Mines Ltd. placed its new overland dried bauxite conveyor into operation at yearend. The six-flight conveyor system replaced a 10,176-meter aerial tramline. Capacity of the conveyor was put at 5 million tons annually.[7]

In early February 1967 the Kaiser Bauxite Co., wholly owned by Kaiser Aluminum and Chemical Corp., dedicated its $35 million bauxite mining, processing, and shipping complex centered around Port Rhoades at Discovery Bay in St Ann Parish. Mining operations, to be carried out in St. Ann and Trelawny Parishes, were initiated in the Tobolski area about 21 kilometers from the port. Mining areas are linked by more than 27 kilometers of standard-gage railway line; 42-ton-capacity ore trucks feed into rail cars for transport to the ore processing plant located about 0.8 kilometer from the dock area. Three drying kilns and a storage area for 200,000 tons, of raw bauxite were planned. Shipping facilities include a 220-meter dock which can accommodate ships up to 37,500 tons. Loading can be accomplished at the rate of 4,500 tons per hour.

In early 1967 it was announced that the Jamaican Government had granted Revere

[7] Skillings Mining Review. V. 57, No. 5, Feb. 3, 1968, p. 1.

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Jamaica Alumina, Ltd., a subsidiary of Revere Copper and Brass, Inc., sufficient bauxite reserves in the Parishes of St. Elizabeth, Westmoreland, St. James, and Trelawny to operate a projected 222,000 ton-per-year alumina plant. Plans contemplated expansion of capacity to 660,000 tons a year. Expenditure of not less than $45 million was planned to permit alumina output to begin in 1971. Terms of the contract are reportedly similar to contracts with other companies except that within 15 years, the Jamaican Government may require Revere to build a second 220,000-ton alumina plant, output of which would be sold at cost to a Jamaican aluminum plant, should one be established.

Antipodes Exploration, Ltd., was reported [8] to be making engineering and geological studies of a large bauxite deposit near Mandeville.

Lead.—The Jamaican Metal Refining Co. Ltd., an affiliate of the Tropical Battery Co. of Jamaica, produced 250 tons of antimonial lead, lead oxide, and plumber' lead in 1967.[9] The company plans to produce 1,000 tons of combined products in 1968. The plant, in Spanish Town, reportedly cost $168,000.

Nonmetals.—At yearend 1967, Consolidated Chemicals, Ltd., composed of U.S. and Jamaican interests, apparently had firm plans to build a $30 million caustic soda plant. The plant would operate on imported salt and produce 170,000 tons of caustic soda annually, a quantity sufficient to meet Jamaican alumina industry requirements and supply a small quantity for export. Byproduct chlorine would be exported as such, or processed into ethylene dichloride for export.

Mineral Fuels.—*Petroleum.*—In early 1967 it was announced that Signal Exploration (Jamaica), a wholly owned subsidiary of Signal Oil and Gas Co., had been granted exploration concessions over a 400-square-mile area onshore west of Kingston, and a 4,400-square-mile offshore area on the shelf along the south and southwest coast. The company had a 2-year search period [10] after which it will have the option of taking out a 4-year prospecting license; at this stage, there is a built-in commitment to drill a test well during the first year of the license. With the discovery of oil, the company would be granted a 30-year mining lease over one-half of the original exploration area. In mid-1967, Signal was engaged in offshore seismic work along the southern coast.

NETHERLANDS ANTILLES

Except for petroleum refining activities, the mineral industry of the Netherlands Antilles is of small consequence and limited to nonmetals production.

Petroleum refining by Shell Curacao, N.V., and Lago Oil and Transport Co. Ltd. is of primary importance to the economy. The direct contribution (value of compensation to employees, taxes, local purchases, contractors, pilot service and other) by the two refineries to the 1966 national product was 22 percent (25 percent in 1965).[11]

Sulfur was produced as an oil refining byproduct and an $11 million desulfurization plant was commissioned at yearend 1967 [12] Lago also reportedly had plans for a desulfurization plant.

Trade in crude petroleum and refinery products is of major importance to the Netherlands Antilles, accounting for over 95 percent of total commodity exports and 78 percent of total commodity imports in 1966.

The following tabulation shows the relationship of mineral trade to total trade for 1965 and 1966:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	589,646	602,809	97.8
1966	581,886	591,714	98.3
Imports:			
1965	510,192	616,042	82.8
1966	498,355	616,052	80.9
Trade balance:			
1965	79,454	−13,233	XX
1966	83,531	−24,338	XX

XX Not applicable.

Source: United Nations. Statistical Papers, Series D, V. 16, Nos. 1–32; Commodity Trade Statistics 1966, pp. 7213–7233.

[8] Skillings Mining Review. V. 56, No. 20, May 20, 1967, p. 19.
[9] American Metal Market. V. 75, No. 43, Mar. 4, 1968, p. 17.
[10] Petroleum Press Service. V. 34, No. 1, January 1967, p. 35.
[11] Department van Sociale en Economische Zaken, Bureau voor de Statistiek. Statistisch Jaarboek 1967 Nederlandse Antillen, p. 77.
[12] Petroleum Press Service. V. 34, No. 12, December 1967, p. 475.

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In terms of total value of commodity trade in 1966, Venezuela was the chief supplier with goods (mostly crude petroleum) worth $466 million. The United States and the Netherlands were next, having supplied $58 million and $21 million in value, respectively.

Exports to the United States in 1966 were valued at $70 million. The next two countries, in order of value, were Canada, $43 million, and the United Kingdom, $41 million.

Table 16.—Netherlands Antilles: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Nonmetals:					
Limestone—cubic meters	e 20,000	31,964	38,273	[1] 59,107	[1] 99,026
Nitrogenous fertilizers	-------	NA	84,000	NA	[2] 143,675
Phosphate rock—thousand tons	r 128	r 121	112	147	116
Salt	281	93	e 2,000	e 2,000	NA
Sulfur, recovered e	35,000	29,000	30,000	30,000	NA
Minerals fuels: Petroleum refinery products:					
Aviation and motor gasoline—thousand 42-gallon barrels	43,462	41,200	43,145	44,623	37,769
Kerosine and jet fuel—do	18,683	19,380	18,116	20,303	38,037
Distillate fuel oil—do	52,027	41,187	32,762	41,319	32,224
Residual fuel oil—do	153,442	161,801	161,636	143,455	138,518
Lubricants—do	2,774	2,891	2,763	2,785	7,039
Other—do	19,215	20,231	21,705	20,358	NA

e Estimate. r Revised. NA Not available.
[1] Sales, in metric tons.
[2] Exports of Aruba.

Table 17.—Netherlands Antilles: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Iron and steel:			
Scrap	3,633	3,066	Surinam 1,785; Netherlands 1,250.
Other	25	---------	
Nonferrous metals and alloys	19	28	All to Italy.
Nonferrous scrap	1,526	5,703	Japan 2,292; West Germany 1,170; United States 899.
Nonmetals:			
Fertilizers, manufactures	-------	105,899	Jamaica 19,872; El Salvador 17,022; India 15,029; Sudan 15,000.
Limestone	10,481	19,079	NA.
Phosphate rock	114,890	147,469	United States 127,729; Belgium-Luxembourg 19,740.
Sulfur	-------	1,967	All to El Salvador.
Nonmetals, n.e.s	9,654	---------	
Mineral fuels: Petroleum:			
Crude—thousand tons	375	344	United States 201; Italy 71; United Kingdom 67.
Refinery products:			
Aviation gasoline—do	1,528	1,156	United States 1,289; United Kingdom 622; Peru 334; Singapore 261.
Motor gasoline—do	3,080	3,159	
Kerosine and white spirit—do	725	502	United States 1,895; Singapore 406; United Kingdom 390; Canada 353; Japan 271.
Jet fuel—do	3,056	3,699	
Distillate fuel oil—do	4,147	5,178	United States 1,124; Japan 854; Netherlands 491.
Residual fuel oil—do	22,211	19,765	United States 15,474; Canada 2,098.
Lubricants including greases—do	1,001	1,019	United Kingdom 460; Netherlands 258.
Vaseline, paraffin, and wax—do	37	26	Mainly to United Kingdom.
Asphalt—do	881	982	NA.
Other [1]—do	34	133	NA.

NA Not available.
[1] Includes process oil and cutbacks.

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Table 18.—Netherlands Antilles: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals.			
Aluminum and alloys, all forms	82	120	United States 36; Italy 33; United Kingdom 30.
Copper and alloys, all forms	241	315	United Kingdom 95; Netherlands 94; United States 61.
Iron and steel:			
Castings and forgings	58	---	
Shapes and sections	2,461	3,311	Netherlands 1,275; West Germany 1,075; Belgium-Luxembourg 763.
Hoop and strip	28	37	United Kingdom 20; United States 10.
Plate and sheet	3,667	2,558	Japan 793; Belgium-Luxembourg 754; Netherlands 520.
Wire	103	87	Netherlands 53. United States 10.
Pipes, tubes, and fittings	6,223	5,268	West Germany 2,331; Italy 654; United States 528.
Other	23	115	Netherlands 45; West Germany 32; United States 31.
Lead and alloys, all forms	57	58	Netherlands 22; United States 10.
Nickel and alloys, all forms	5	4	United States 2; United Kingdom 2.
Silver and platinum group metals, all forms. troy ounces	531	---	
Tin and alloys, all forms long tons	4	24	Mainly from Netherlands.
Zinc and alloys, all forms	71	73	Do.
Metalliferous ores, n.e.s	134	376	Surinam 214; United States 161.
Nonferrous metal scrap	101	4,454	Mainly from Colombia.
Other nonferrous metals and alloys	65	22	Netherlands 10; United States 6; Italy 5.
Nonmetals:			
Cement	32,847	31,792	Venezuela 17,495; Colombia 12,343.
Clay and clay products:			
Common and fire clay	5,036	6,154	Mainly from United States.
Refractory bricks	2,061	1,105	Netherlands 571; United Kingdom 200.
Fertilizer:			
Natural	31,460	15,270	All from United States.
Manufactured	142	2,707	Mainly from United States.
Lime	202	NA	
Salt	632	633	Mainly from United States.
Sand, stone and gravel	7,288	13,594	Surinam 11,629; Trinidad and Tobago 1,021.
Sodium carbonate	142	---	
Sodium hydroxide	33,997	27,725	Netherlands 17,430; United States 10,289.
Nonmetals, n.e.s	1,992	NA	Quantity unknown. Value $2,599.000.
Other crude minerals	---	9,415	United States 5,073; Venezuela 2,072; United Kingdom 1,778.
Mineral fuels:			
Coal, coke and briquets	42	59	Mainly from United States.
Mineral tars and derivatives	34	159	Do.
Petroleum:			
Crude thousand tons	40,811	39,761	Mainly from Venezuela.
Natural gasoline do	57	42	All from Venezuela.
Refinery products:			
Aviation gasoline do	598	292	Mainly from Venezuela.
Other gasoline do	372	255	Do.
Kerosine and jet fuel do	242	245	Trinidad and Tobago 115; Venezuela 80.
Distillate fuel oil do	217	300	Venezuela 140; Singapore 80; Netherlands 63.
Residual fuel oil do	913	772	Venezuela 656; Malaysia 46.
Lubricants, including greases do	1,057	14	Mainly from United States.
Butane do	76	73	All from Venezuela.
Other [1] do	10	274	NA.

NA Not available.
[1] Includes process oil and asphalt.

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TRINIDAD AND TOBAGO

While there were indications of weakness in segments of the economy of Trinidad and Tobago in 1967, the gross domestic product (GDP) increased slightly more than 6 percent over that of 1966 level.[13] The petroleum sector made the largest contribution to 1967 economic growth with a net production of $212 million or about 28 percent of the GDP.

In late 1967 the Government of Trinidad and Tobago proposed changes in legislation relating to the petroleum industry. The Government claimed that terms of the submarine well allowance were too generous; it wished to substitute a production allowance that it believed would still provide incentive to marine operations, although at a lesser rate of return to the companies.

While the proposed laws would increase the Government income from the oil industry over the next few years, it was alleged that future income would be substantially curtailed and that oilfield development would slacken.[14]

One of the more serious economic problems in 1967 was the level of 14 percent unemployed of the total labor force. Important as the petroeum industry is, it employed only about 6 percent of the total labor force, and in 1967 was reducing its work force.

PRODUCTION

Aside from asphalt, crude oil, petroleum products, nitrogenous fertilizers, and sulfur, mineral commodity output has been largely limited to construction materials for local use.

Crude oil output in 1967 attained a new high, nearly 17 percent over the 1966 figure. Refinery output of motor gasoline increased 9.3 percent over 1966 production, but other refinery production showed decreases or only slight increases.

The steady upward trend of fertilizer output continued with increased tonnage of nearly 40 percent in 1967.

TRADE

Trinidad's most valuable trade commodities were crude petroleum and refinery products. Imports of crude petro-

[13] Barclays Overseas Survey. London, 1968, p. 147.

[14] Petroleum Press Service. V. 34, No. 12, December 1967, pp. 454–456.

Table 19.—Trinidad and Tobago: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Nonmetals:					
Cement—thousand tons	162	176	189	209	190
Clays—thousand cubic meters	78	53	71	74	74
Diorite—do	8	9	6	6	3
Gypsum	3,005	2,296	1,865	2,013	3,647
Limestone—thousand cubic meters	526	525	435	471	435
Nitrogenous fertilizers—thousand tons	99	229	280	380	530
Porcellanite—thousand cubic meters	39	31	55	76	14
Sand and gravel—do	470	606	245	291	189
Sulfur	6,735	5,407	3,783	4,074	NA
Mineral fuels:					
Asphalt, natural and similar materials:					
Natural asphalt—thousand tons	172	195	171	158	145
Pitch sand—thousand cubic meters	10	19	15	34	10
Natural gas, gross production—million cubic feet	99,376	110,732	111,503	118,927	140,338
Natural gas liquids—thousand 42-gallon barrels	170	200	197	188	183
Petroleum:					
Crude—do	48,678	49,731	48,859	55,603	64,995
Refinery products:					
Aviation gasoline—do	970	977	864	2,109	1,746
Motor gasoline—do	18,302	17,747	17,208	17,868	19,524
Kerosine and jet fuel—do	9,482	11,845	17,101	16,443	15,331
Distillate fuel oil—do	20,055	19,658	19,447	19,892	19,191
Residual fuel oil—do	66,271	71,287	75,442	80,352	75,496
Liquefied petroleum gases—do	109	146	182	254	312
Lubricants—do	2	406	835	1,014	1,233
Other—do	693	840	822	1,824	1,924

NA Not available.

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leum in 1966 were valued at $227 million, while the next most valuable category was iron and steel products at $15 million. Exports of crude petroleum and petroleum products in 1966 were valued at $356 million.

In 1965 (the most recent year for which details have been compiled), Venezuela supplied total imports valued at $123 million followed by the United States with $81 million, the United Kingdom with $80 million, and Saudi Arabia with $79 million. Imports from Venezuela and Saudi Arabia were primarily crude oil.

Exports in 1965 were directed primarily to the United States ($131 million), followed by the United Kingdom ($67 million), and the Netherlands ($35 million).

The following tabulation shows the relation between total trade and mineral trade for Trinidad and Tobago for 1965 and 1966.

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	[1] 333	407	81.8
1966	369	431	85.6
Imports:			
1965	[1] 237	482	49.2
1966	253	462	54.8
Trade balance:			
1965	[1] +96	−75	XX
1966	[1] +116	−31	XX

XX Not applicable.
[1] Mineral fuels and related materials only.

Source: Government of Trinidad and Tobago Central Statistical Office. Overseas Trade. Part B. Port of Spain, 1965, p. 205.

Table 20.—Trinidad and Tobago: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Scrap	67	45	United Kingdom 29; West Germany 15.
Metal and alloys, other forms	77	115	Mainly to Guyana.
Copper:			
Scrap	148	242	Denmark 131; West Germany 108.
Metal and alloys, other forms	55	8	Stores and bunkers 3; Guyana 2.
Iron and steel:			
Scrap	3,535	6,757	Mexico 4,166; Venezuela 2,542.
Pig, sponge, and primary forms	4	1	Mainly to St. Vincent.
Semimanufactures:			
Structural shapes	90	339	Antigua 114; Guyana 78; St. Lucia 64.
Plates and sheets, all types	208	490	Grenada 255; St. Vincent 53; St. Lucia 51.
Other	138	162	Guadeloupe 69; Netherlands Antilles 19.
Lead:			
Scrap	2	---	
Metal and alloys, other forms	265	56	Panama 27; Venezuela 12; Barbados 9.
Nickel and alloys, wrought	2	1	Mainly to Venezuela.
Platinum, troy ounces	---	3	All to United Kingdom.
Silver, not worked, do	80	300	All to Barbados.
Tin:			
Scrap, long tons	94	338	Mainly to Netherlands.
Tin and tin alloys, do	[1]	1	Mainly to Dominica.
Zinc, zinc alloys and scrap	7	1	Mainly to United Kingdom.
Nonferrous scrap, unclassified	3,380	271	Denmark 106; stores and bunkers 70.
Nonmetals:			
Barite, not calcined	---	947	Barbados 490; Guyana 457.
Cement	NA	50	Mainly to Surinam.
Clay and clay products:			
Clays	2	1	Mainly to stores and bunkers.
Common brick	[1]	24	Grenada 12; St. Vincent 6.
Fertilizer materials:			
Natural	1	---	
Manufactured:			
Nitrogenous	102,217	116,901	United States 26,715; Brazil 17,361; Guyana 14,644.
Phosphatic	[1]	---	
Mixed	8	7	Mainly to Barbados.
Gravel and crushed rock	1,525	249	Surinam 102; Netherlands Antilles 102.
Lime	616	570	Guyana 251; St. Kitts-Nevis 152.
Salt	11	11	Stores and bunkers 6; Grenada 3.
Sand	208	244	Venezuela 108; Netherlands Antilles 102.

See footnotes at end of table.

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Table 20.—Trinidad and Tobago: Exports and reexports of mineral commodities —Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals—Continued			
Sodium carbonate	(1)	2	Grenada 1; stores and bunkers 1.
Sodium hydroxide	10	5	Grenada 3; stores and bunkers 1.
Stone	1	1	Mainly to Grenada.
Other nonmetals	396	226	Mainly to stores and bunkers.
Mineral fuels:			
Coal and coke	468	378	Barbados 259; Guyana 55.
Liquefied petroleum gas	9,742	17,780	Guadeloupe 6,724; United Kingdom 3,614; Surinam 2,743.
Mineral tar	4	(1)	Mainly to stores and bunkers.
Natural asphalt	61,287	64,962	Mainly to United Kingdom.
Petroleum:			
Crude—thousand 42-gallon barrels	4,324	657	All to Canada.
Refinery products:			
Aviation gasoline—do	18,300	17,970	United States 7,234; Japan 2,044; Oceania 1,468; Netherlands Antilles 1,419.
Motor gasoline—do	7,089	8,939	United Kingdom 6,332; Sweden 1,088.
Kerosine—do	1,003	149	Mainly to United Kingdom.
Distillate fuel oil—do	19,088	19,327	Netherlands 5,402; Sweden 3,361.
Residual fuel oil	75,181	78,154	United States 42,736; bunkers 7,184.
Lubricants, including greases	97,763	157,252	Canada 30,192; Brazil 25,822; United Kingdom 25,404; Belgium-Luxembourg 24,493.
Asphalt	18,304	15,616	Guadeloupe 4,555; Guyana 3,501; Antigua 1,609.
Tar oil	77,769	161,763	United States 72,523; Netherlands 55,358; United Kingdom 27,389.
Partly refined—do	6,695	11,126	Puerto Rico 4,052; Canada 3,651; United States 3,261.
Other	19,133	17,291	Mainly to Guyana.

NA Not available.
[1] Less than ½ unit.

Source: Government of Trinidad and Tobago, Central Statistical Office. Overseas Trade. Part A. Port of Spain, 1965, 397 pp.; 1966, 397 pp.

Table 21.—Trinidad and Tobago: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys, all forms	995	653	Canada 265; United Kingdom 205; United States 100.
Copper:			
Metal and alloys, all forms	287	207	Mainly from United Kingdom.
Sulfate	21	20	Do.
Iron and steel:			
Scrap	(1)	218	Mainly from United States.
Pig, sponge, and primary forms	173	623	Netherlands 324; United Kingdom 141.
Semimanufactures:			
Structural shapes	12,478	11,167	Belgium-Luxembourg 4,815; United Kingdom 4,108.
Plates and sheets, all types	14,398	10,578	United Kingdom 5,676; Australia 2,546.
Pipes and tubes	35,758	30,913	United Kingdom 24,063; United States 2,589.
Other	203	519	Belgium-Luxembourg 275; West Germany 120; United Kingdom 93.
Lead: Metal and alloys, all forms	47	59	United Kingdom 38; West Germany 20.
Nickel and alloys, all forms	8	18	United Kingdom 4; Netherlands 4; Japan 4.
Platinum all forms—troy ounces	98	2,322	Mainly from Canada.
Silver, including partly wrought—do	25,498	21,319	Mainly from United Kingdom.
Tin and alloys, all forms—long tons	4,192	4,139	United Kingdom 2,698; Canada 771.
Zinc and alloys, all forms	18	22	United Kingdom 11; Canada 5.
Nonferrous metals, scrap and ores	5	29	Guyana 13; China (mainland) 7.

See footnotes at end of table.

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Table 21.—Trinidad and Tobago: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals:			
Abrasives, natural	8	4	Mainly from United Kingdom.
Arsenic and compounds	11	263	Mainly from Jamaica.
Asbestos, crude	1	---	
Barite, crude and ground	27,734	58,545	Brazil 36,578; Canada 8,418; West Germany 7,453.
Cement	7,411	3,815	Venezuela 2,240; United Kingdom 1,212.
Clay and clay products:			
Clay	562	548	Mainly from United States.
Common brick	32	17	All from United Kingdom.
Refractory brick	1,114	708	Do.
Feldspar	106	---	
Fertilizer materials:			
Natural	88	64	Mainly from Japan.
Manufactured:			
Nitrogenous	19	46	Mainly from Canada.
Phosphatic	911	549	Mainly from Netherlands.
Potassic	3,104	1,514	East Germany 1,168; West Germany 198.
Mixed	1,645	2,350	Italy 1,326; West Germany 437.
Graphite	(1)	5	All from United Kingdom.
Gravel and crushed rock	354	276	Italy 99; United States 78; Venezuela 78.
Lime	8	10	All from United Kingdom.
Magnesite	84	27	All from Netherlands.
Mica	27	25	Norway 19; Sweden 6.
Salt	8,482	9,984	Mainly from United Kingdom.
Sand	113	45	United Kingdom 27; United States 18.
Sodium carbonate	2,366	1,955	Mainly from United Kingdom.
Sodium hydroxide	2,467	4,301	Do.
Stone:			
Dimension	25	208	Mainly from United States.
Industrial	7,281	12,822	Jamaica 9,455; Venezuela 2,007.
Sulfur	17,047	17,235	Mainly from United States.
Other nonmetals	1,737	2,220	Italy 690; United Kingdom 647; Canada 393.
Mineral fuels:			
Coal and coke	1,115	73	All from United Kingdom.
Gas, manufactured	41	88	Mainly from United States.
Mineral tar	33	18	Mainly from United Kingdom.
Mineral wax	18	8	All from United States.
Petroleum:			
Crude thousand 42-gallon barrels and partly refined.	93,709	93,114	Venezuela 53,155; Saudi Arabia 27,619; Colombia 9,596.
Refinery products:			
Motor gasoline ---do---	1	276	Mainly from Venezuela.
Distillate fuel oil ---do---	(1)	204	Nigeria 124; Venezuela 79.
Residual fuel oil ---do---			
Lubricants, including greases	5,182	4,449	United Kingdom 2,151; United States 1,087.
Vaseline and paraffin	330	613	Mainly from United States.
Tar oils	40,229	2,026	Mainly from Venezuela.
Other	r 3,314	1,821	Mainly from United Kingdom.

r Revised.
1 Less than ½ unit.
Source: Government of Trinidad and Tobago, Central Statistical Office. Overseas Trade. Part A. Port of Spain, 1965, 397 pp.; 1966, 397 pp.

COMMODITY REVIEW

Nonmetals.—*Porcellanite.*—Small tonnages of porcellanite have been produced for use in oilfield road construction. While not particularly suitable for this use, porcellanite, a fused clay and silt formed by spontaneous combustion of interbedded lignite, was handy and cheap. In mid-1967, the local market price was $1.20 per cubic yard at the pit. Chemically, the rock is 52 percent silica, 22 percent alumina, 8 percent ferric oxide, 7 percent combined water, with minor quantities of other combined elements; alunite content is reportedly appreciable. Porcellanite is said to have good pozzolanic properties; small quantities have been exported for analysis and testing.

Mineral Fuels.—*Petroleum.*—Footage drilled in Trinidad oilfields in 1967

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amounted to 928,013 feet, a decline of nearly 22 percent from 1966 drilling. The average number of wells producing oil in 1967 rose to 3,417, a gain of 53 wells over the 1966 figure.

Average daily crude oil production in 1966 was 152,340 barrels; during the first 9 months of 1967, average daily production was 174,100 barrels. About 37 percent of the total comes from some 290 offshore wells averaging 220 barrels per day. More than 3,000 land-based marine wells and onshore wells each produced 35 to 36 barrels per day.

While rising output gives the appearance of a healthy oil industry, the long-term aspect is clouded by lack of known reserves.

In its Annual Report for 1967, the British Petroleum Co. Ltd. (BP), announced it had ceased drilling on land at the end of March 1967 because of lack of reserves and new locations. It appeared that Trinidad Petroleum Development Co., Ltd., in which BP holds an 88 percent interest, would make little or no profit over the next 10 years and was unlikely to be able to pay dividends; it was decided to put the company into liquidation, and efforts were in progress to dispose of the company's holdings. BP had a one-third interest in offshore wells which had a total average daily output of 19,000 barrels.

Texaco Trinidad, Inc., was successful in its exploration drilling in 1966, particularly in the Guayaguayare area of southeastern Trinidad. A drilling campaign carried on into 1967 has resulted in production of 30,000 barrels per day for the area.

In 1966 an aeromagnetic survey over some 3,000 square miles of Continental Shelf area north and northeast of Trinidad was carried out with United Nations Development Fund (UNDF) assistance, and gave results that suggested that a more detailed study would be desirable. In 1967 the Government and the UNDF were working out a plan to conduct seismograph work in the area between Trinidad and Tobago.

In addition to routine exploration drilling carried on by the various operating companies, Pan American (Trinidad) Oil Co. (Pan Am) spudded in an offshore wildcat test that could have an important bearing on the Trinidad oil industry. After 2 years of study and the drilling of one dry test, PanAm started drilling at a location 65 kilometers east-southeast of Point Galeota. The floating rig, operated by Santa Fe Marine, Inc., was anchored in water nearly 230 feet deep. The operation reportedly was to cost $2.9 million, and the Government agreed to give the company a special sliding scale deduction allowance related to production.

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The Mineral Industry of Central American Areas

By Burton E. Ashley [1]

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BRITISH HONDURAS

The mineral industry of British Honduras remained insignificant and limited to the extraction of small quantities of limestone, sand, and gravel.

The policy of the Government of British Honduras appears to be favorable to the entry of foreign risk capital in prospecting ventures. Companies and individuals searched for metals and petroleum throughout 1967 but by yearend no discoveries had been announced.

Duncan R. Derry Limited, of Canada, was given an exclusive prospecting license covering approximately 2,000 square miles in the southwestern part of the country, beyond the Maya Mountain range. The license, valid for 4 years beginning in 1966, requires the company to spend a minimum of $61,000 [2] a year to supply local demand for minerals on special terms, and to process minerals produced within the country if feasible. Indications of copper, zinc, and gold have been reported previously in the area of the company's concession.

An American individual conducted an aerial survey, presumably for iron ore, in 1967 but results were not announced.

PRODUCTION

The Public Works Department (PWD) is the largest producer of limestone, sand, and gravel in the country. Quantity of output was estimated for limestone but production by the PWD of sand and gravel was not reported. Belize Sand and Gravel Company Limited reported output of 62,525 cubic yards of river gravel in 1967.

Value of the reported production was $621,875.

Table 1.—British Honduras: Estimated production of mineral commodities

(Metric tons)

Commodity	1965	1966	1967
Limestone	57,376	58,000	64,000
Sand and gravel [1]	84,400	57,230	NA

NA Not available.
[1] Reportedly comprises 50 percent sand and 50 percent gravel.
Source: U.S. Consulate, Belize City.

TRADE

Exports and reexports were essentially limited to small quantities of scrap metal and petroleum products. The principal import commodity is petroleum products, followed by fertilizers and iron and steel semimanufactures. The country's main trading partner in 1966 was the United

[1] Physical scientist, Division of International Activities.
[2] Where necessary, values have been converted from British Honduran dollars (BH$) to U.S. dollars at the rate of BH$1.64=US$1.

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Kingdom, which supplied 38.25 percent of all British Honduran imports, and took 46.78 percent of its exports. The United States was the next largest trading partner, having supplied 33.52 percent of all imports and having taken 23.63 percent of the exports.

The following tabulation shows the relation between trade in mineral commodities and total commodity trade for 1965 and 1966:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	182	12,212	1.5
1966	140	13,454	1.0
Imports:			
1965	2,731	24,467	11.2
1966	2,932	27,106	10.8
Trade balance:			
1965	−2,549	−12,255	XX
1966	−2,792	−13,652	XX

XX Not applicable.

Table 2.—British Honduras: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

	1965	1966	Principal destinations, 1966
Metals:			
Iron and steel:			
Scrap	40	381	Mainly to Mexico.
Semimanufactures	52	4,186	Do.
Nonferrous metals: Semimanufactures	6	-----	
Nonmetals:			
Cement	605	448	All to Mexico.
Salt	---	5	Do.
Mineral fuels:			
Petroleum refinery products, thousand 42-gallon barrels	15	14	Mainly to bunkers.

Source: British Honduras. Trade Report. Belize City 1967, pp. 109.

Table 3.—British Honduras: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Iron and steel semimanufactures	2,606	3,083	United Kingdom 2,002; United States 364; Belgium 271.
Nonferrous semimanufactures	61	137	Mainly from United Kingdom.
Nonmetals:			
Cement	9,893	9,625	Honduras 6,274; Jamaica 3,134.
Fertilizer materials:			
Nitrogenous	920	324	United States 162; West Germany 97.
Phosphatic	3,016	545	Mainly from United States.
Potassic	145	7	All from United States.
Other, not specified	211	2,225	Mainly from United States.
Lime	171	805	Mainly from United Kingdom.
Salt	577	595	All from United Kingdom.
Mineral fuels:			
Coal and coke	27	22	United Kingdom 13; United States 8.
Natural gas liquids	383	435	Mexico 292; Guatemala 90; United States 51.
Petroleum refinery products:			
Gasoline, thousand 42-gallon barrels	79	90	Mainly from Jamaica.
Kerosine, do.	32	38	Do.
Fuel oil, all types, do.	104	95	Jamaica 71; Guatemala 19.
Lubricating oils, do.	6	7	Curaçao 3; United States 2; Jamaica 1.
Greases	37	36	Mainly from United States.
Paraffin, petrolatum, waxes	5	-----	
Other	1,399	743	Mainly from Trinidad and Tobago.

Source: British Honduras. Trade Report, Belize City, 1967, pp. 109.

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COMMODITY REVIEW

Mineral Fuels.—*Petroleum*—A trade journal [3] reported that six deep offshore test wells had failed to find production. The deepest well, drilled on Palmetta Cay, reached 16,000 feet. Shell Oil Co. spudded a 10,000-foot test well in the southeast part of Turneffe Island in November 1966; the company was still drilling at yearend. Shell will earn a one-half interest in the concession held by Phillips Petroleum Co. with the completion of this well.

In late 1967, two offshore exploration licenses were granted to unnamed interests of undetermined national origin. The leases are in the southern territorial waters of British Honduras.

COSTA RICA

Costa Rica's negligible minerals industry may become of increasing importance if exploration efforts in the country prove successful. Resource investigations were being carried on for minerals and petroleum, mostly by foreign firms. Technical assistance was available from Costa Rican Government agencies, the U.S. Agency for International Development (AID), and the University of Costa Rica.

The AID program provided for laboratory investigation of samples in the United States. AID also acted as middleman between private industry and the Costa Rican Government in cases needing further exploration or development capital.

The Government continued to be receptive to the entry of foreign investment into the country.

PRODUCTION

Costa Rica's production of mineral commodities consisted primarily of salt, cement, and construction materials. Fertilizer materials and refinery products were processed from imported raw materials. The country's only oil refinery began production in 1967.

Approximate values of selected commodities produced in 1967 were as follows: Fertilizer materials, $5.5 million; refinery products, $4.3 million; cement, $2.5 million.

[3] Petróleo Interamericano. January 1967, pp. 16–18.

Table 4.—Costa Rica: Approximate production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Gold e troy ounces	3,000	3,000	570	570	500
Manganese ore	600	-------	-------	-------	NA
Nonmetals:					
Cement	------	33,000	119,000	114,750	110,500
Diatomite e	1,900	3,600	3,000	3,000	10,000
Fertilizer materials:					
Nitrogenous	NA	NA	e 59,900	11,587	17,855
Mixed	NA	NA	e 95,000	NA	42,640
Lime e	5,000	6,500	12,000	12,000	7,759
Limestone e	30,000	126,200	219,000	229,000	229,492
Salt	5,698	20,000	1,848	1,930	9,804
Sand and gravel e	NA	50,000	75,000	75,000	75,000
Stone, crushed and broken e	NA	50,000	172,000	172,000	172,000
Mineral fuels: Petroleum refinery products:					
Motor gasoline thousand 42-gallon barrels	------	-------	-------	-------	175
Kerosine do	------	-------	-------	-------	27
Distillate fuel oil [1] do	------	-------	-------	-------	254
Residual fuel oil [1] do	------	-------	-------	-------	158

e Estimate. NA Not available.
[1] Exclusive of refinery fuel.

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TRADE

In 1966 Costa Rica took measures to improve its balance of visible trade because of the previous deteriorating trend. Import values for 1965 and 1966 showed little change, but a rise in exports helped to create an improved balance over that of 1965.

The United States is Costa Rica's primary trading partner, but mineral commodity exports went mainly to Nicaragua and other neighboring countries. The United States was the leading supplier of nonfuel mineral imports, while Venezuela, the Netherlands Antilles, and El Salvador supplied most of the fuel materials.

The following tabulation compares value of Costa Rica's mineral commodity trade with its total trade for 1965 and 1966.

	Value (million dollars) [1]		Mineral comodities' share of total (percent)
	Mineral comodities	Total trade	
Exports:			
1965	4.9	111.8	4.4
1966	4.7	135.5	3.5
Imports:			
1965	37.7	178.2	21.2
1966	27.1	178.4	15.2
Trade balance:			
1965	−32.8	−66.4	XX
1966	−22.4	−42.9	XX

XX Not applicable.
[1] Where necessary, values have been converted from Costa Rican colones (CR¢) to U.S. dollars at the rate of CR¢ 6.65 = US$1.

Table 5.—Costa Rica: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum	------	34	Mainly to Nicaragua.
Iron and steel, all forms	4,199	7,429	Nicaragua 4,740; El Salvador 1,415.
Lead, all forms	69	16	Mainly to Guatemala.
Zinc and alloys	3	12	West Germany 9.
Nonferrous metals and alloys, all forms, not elsewhere specified.	17	142	West Germany 88; United States 20.
Nonmetals:			
Cement	2,988	6,106	Nicaragua 6,079.
Clay and clay products	------	1,110	Mainly to Nicaragua.
Diatomite	NA	75	Nicaragua 61.
Fertilizers, manufactured	42,467	45,769	Panama 7,724; Mexico 7,112; Nicaragua 6,006.
Salt	NA	4	All to Nicaragua.
Stone:			
Dimension	------	276	Nicaragua 242.
Industrial	------	1,680	Nicaragua 1,537.

NA Not available.
Source: Ministerio de Industria y Comercio. Dirección General de Estadística y Censos. Comercio Exterior de Costa Rica 1966. San José, Costa Rica, 1966, pp. 420.

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Table 6.—Costa Rica: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys, all forms	777	808	United States 170; Switzerland 154; West Germany 141.
Copper and alloys:			
Metal, all forms	318	284	El Salvador 70; Japan 60; Mexico 32; West Germany 22.
Sulfate	30	26	United Kingdom 13; United States 9.
Iron and steel:			
Ingots and equivalent forms	11,535	9,568	Belgium-Luxembourg 3,899; West Germany 2,759; France 1,501.
Semimanufactures	53,380	47,031	United States 8,423; West Germany 6,867; Belgium-Luxembourg 6,426.
Scrap	1	1	All from United States.
Lead and alloys, all forms	131	110	West Germany 62; United States 21.
Nickel and alloys, all forms	8	5	United Kingdom 2; West Germany 2; Canada 1.
Platinum group metals and alloys, all forms.	13,246 troy ounces	3,376	United States 2,989; Netherlands 387.
Silver and alloys	4,019 do.	9,002	United States 8,327.
Tin and alloys, all forms	6 long tons	17	United States 11; West Germany 4.
Zinc and alloys, all forms	925	857	Australia 381; Japan 290.
Other: Nonferrous ore and concentrates, not further classified.	6	21	Guatemala 20.
Nonmetals:			
Abrasives:			
Natural	10	14	United States 5; Italy 5.
Industrial diamond	carats	50,000	Mainly from United States.
Asbestos	292	141	Canada 134.
Cement:			
Asbestos	184	55	El Salvador 21; Guatemala 20.
Portland	26,683	7,416	Japan 4,071.
Clay and clay products:			
Kaolin	212	136	United States 120.
Refractory and common	765	608	Mainly from United Kingdom.
Nonrefractory brick	121	78	All from Nicaragua.
Refractory brick	579	233	United States 227.
Diatomite	1,102	464	Mainly from United States.
Feldspar, fluorspar, and cryolite	13	5	All from United States.
Fertilizers:			
Nitrogenous	83,820	29,714	West Germany 9,483; Colombia 6,491; Netherlands Antilles 5,564.
Phosphatic	71,542	15,512	United States 15,056.
Potassic	11,319	13,506	United States 6,484; Canada 4,111; West Germany 2,893.
Mixed	16,325	19,994	Netherlands 8,251; West Germany 7,362.
Graphite	2	5	United Kingdom 2; United States 1.
Gypsum:			
Crude	3,812	3,222	Mainly from Nicaragua.
Calcined	160	118	West Germany 110.
Lime, all types	43	4	United States 2.
Marble	161	108	Guatemala 63; Italy 45.
Mica	3	1	Mainly from Panama.
Pigments, mineral	2	6	West Germany 3; United Kingdom 3.
Quartz	1	21	United States 17.
Salt, all forms	258	1,478	Nicaragua 969; Honduras 370.
Stone, sand and gravel:			
Dimension	200	26	Italy 17.
Industrial, type not specified	3,975	NA	
Sand, gravel, crushed rock	14	8	Mainly from United States.
Sulfur	-----	60	All from West Germany.
Talc	139	118	Italy 37; West Germany 25; France 20.
Mineral fuels:			
Coal, coke, and briquets	131	247	West Germany 160; United States 66; Netherlands 10.
Mineral tars and products	222	268	United States 234.
Natural gas liquids	1,850	2,502	Venezuela 2,366.
Petroleum:			
Crude and partially refined	-----	17,477	All from Venezuela.
Refinery products:			
Gasoline	67,051	70,471	Netherlands Antilles 29,814; El Salvador 22,240.
Kerosine	14,442	15,109	Netherlands Antilles 6,540; El Salvador 4,120.
Distillate fuel oil	173,569	180,670	Venezuela 67,641; Netherlands Antilles 55,369; El Salvador 26,050.
Lubricants including greases	10,854	299	United States 296.
Paraffin, petrolatum, and waxes.	201	2,114	United States 1,977.
Asphalt and coke	10,367	7,810	Venezuela 7,298; Mexico 231.

NA Not available.

Source: Ministerio de Industria y Comercio, Dirección General de Estadística y Censos, Comercio Exterior de Costa Rica 1966. San José, Costa Rica, 1966, 420 pp.

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COMMODITY REVIEW

Metals.—*Aluminum.*—Aluminum Company of America (Alcoa) continued its study of the lateritic bauxite deposits over which it has rights under a 25-year industrial contract. The concession area covers 250 square kilometers. If studies indicate sufficient economic reserves, Alcoa is expected to export 500,000 tons of bauxite annually. The bauxite is reportedly of low grade but proximity to the port of Punta Uvita may make the project feasible.

It was also reported that the Costa Rican Government was investigating small areas of high-grade bauxite with a view to development of the deposits for chemical use on the local market.

Iron and Steel.—The Costa Rican Government wishes to establish an iron and steel facility in the country. Only 3.5 million tons of iron ore is known in the domestic reserve, and exploration for additional ore was continuing.

Manganese.—Mining of manganese is reportedly in progress. A heavy medium concentrating plant may be installed to prepare concentrates for export. Exports, if found to be feasible, cannot be effected until serviceable pier facilities can be installed.

Nonmetals.—*Diatomaceous Earth.*—A deposit containing an estimated 2 million tons of diatomaceous earth was being investigated for possible industrial use. A 10-ton-per-day pilot plant was in operation, but further details were unavailable.

Fertilizer Materials.—Fertilizantes de Centro América, Costa Rica, S.A. (Fertica), largely owned by Standard Oil Co. of New Jersey, requested increased tariff protection for its products in late 1967, claiming that unfair dumping practices of foreign suppliers prevented full use of its facilities, thereby causing a rise in its unit costs. In spite of aggressive promotional efforts, Fertica was operating at only about 37 percent of installed capacity.

In September 1967, Fertica was granted an industrial contract to establish a plant in Puntarenas to produce complex fertilizer mixes by the dry method. The mixes will be produced according to clients' specifications. The dry-mix plant will complement Fertica's present facilities for producing chemical fertilizers.

Sulfur.—Pascar Oils Limited [4] acquired five concessions for sulfur exploration covering about 13 square kilometers, and were negotiating for an additional 30 square kilometers. Concessions were in Guanacaste Province in northwestern Costa Rica. The company began core-drilling to prove tonnage and average value. Grab and channel samples taken during preliminary examination ranged from 1½ percent to over 73 percent sulfur. The sulfur is of volcanic origin.

Consolidated Negus Mines Limited [5] also has a volcanic sulfur property with reported indicated reserves of 3 million tons averaging 29.92 percent sulfur. Inferred ore could add substantially to the reserves.

Caribe Texas Co. was reportedly investigating sulfur deposits in the San Carlos area in the northeast. Probable and possible reserves of 10 to 60 million tons of ore, containing an average of 23 percent sulfur, have been reported.

Mineral Fuels.—*Petroleum.*—Costa Rica's only petroleum refinery, Refinadora Costarricense de Petróleos S.A., made a test run in late 1966 and began operations in late 1967, running 670,531 barrels of feed-stock by yearend. The 8,000-barrel-per-day refinery is owned as follows: local interests, 55 percent; Costa Rica Government, 30 percent; and Allied Chemical Corp., 15 percent.

In 1965 exploration rights were granted to the French Government company, Entreprise de Recherches et d'Activities Petrolieres (ERAP). The concession was said to include the Continental Shelf area from Puerto Limón northward to the Nicaraguan border, and a strip along the Nicaraguan frontier from coast to coast. ERAP was known to have completed some offshore seismic work, but there have been no reports of work done on land areas.

[4] Mining Journal (London). July 14, 1967, p. 29.
[5] World Mining. February 1968, p. 54.

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EL SALVADOR

El Salvador's economy generally continued to expand in 1967 although at a somewhat reduced rate. Gross national product (GNP) at current prices increased about 4 percent in 1967 over that of 1966. The per capita GNP in 1967 was $267 compared with $258 in 1965.

The minerals industry of El Salvador remained small, supplying local consumers with construction materials, fertilizers, and petroleum refinery products. Value of mineral output was not available, but it was of no great consequence in the overall economy. The Government has a favorable attitude toward foreign investment, but there appeared to be little scope for large-scale investment in the mineral industry.

The Government has undertaken a joint 3-year investigation of mineral resources with the United Nations Special Fund. Total cost of the project was budgeted at $875,800, of which the Special Fund will supply $483,000.

A geochemical examination of the important river systems was planned as well as drilling and trenching in areas of known mineralization. Gold and silver were formerly mined in El Salvador, and it is hoped that discoveries will be made that will reactivate the industry.

PRODUCTION AND TRADE

Scanty returns listing production of construction material within El Salvador show only a part of actual output. Consumption [6] figures of local industries record use of sand, gravel, crushed rock, lime, and other material that came from domestic production but that were not listed in production returns.

Trade patterns showed no great change for the period. Iron and steel products and semimanufactures and petroleum are the main mineral import items. Imports of refinery products were generally down, but crude oil imports gained considerably in 1966 over the amount recorded in 1965.

The most significant mineral commodity exports were manufactured fertilizers, building material, and some refinery products. The greatest share of such trade was with neighboring countries.

The following tabulation shows the relationship between total trade and mineral commodity trade for 1965 and 1966:

	Value (million dollars) [1]		Mineral commodities' share of total (percent)
	Mineral commodities	All trade	
Exports:			
1965	5.5	188.7	2.9
1966	4.3	188.9	2.3
Imports:			
1965	33.6	200.6	16.7
1966	34.9	220.0	15.9
Trade balance:			
1965	−28.1	−11.9	XX
1966	−30.6	−31.1	XX

XX Not applicable.

[1] Where necessary, values have been converted from El Salvador colones (ES¢) to U.S. dollars at the rate of ES¢1 = US$0.40.

[6] Ministerio de Economia. Dirección General de Estadística y Censos. Anuario Estadístico, v. 3, 1966, pp. 97.

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Table 7.—El Salvador: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Aluminum, extrusions	NA	NA	NA	NA	822
Iron and steel, rolled products	2,677	NA	NA	NA	24,117
Nonmetals:					
Cement	66,188	53,588	r 80,718	r 142,175	143,054
Clay	13,900	11,200	14,300	NA	NA
Fertilizers:					
Phosphatic	NA	NA	6,222	12,551	15,663
Mixed	NA	NA	NA	45,966	33,528
Limestone and sea shells	93,200	75,500	95,900	213,424	245,824
Salt, marine	72	21,984	r 22,635	r 19,212	NA
Mineral fuels:					
Petroleum refinery products:					
Motor gasoline thousand 42-gallon barrels	793	1,024	991	994	1,070
Jet fuel do.	NA	NA	NA	NA	83
Kerosine do.	124	238	353	444	427
Distillate fuel oil do.	644	851	992	1,070	1,083
Residual fuel oil do.	211	1,119	664	642	577
Liquefied petroleum gas do.	13	32	34	51	105
Total do.	1,785	3,264	3,034	3,201	3,345

r Revised. NA Not available.

[1] Gold, silver and simple construction materials may be produced in small quantities but no data are avilable.

Table 8.—El Salvador: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum, semimanufactures	-----	66	Nicaragua 21; Guatemala 15; Honduras 14.
Copper and alloys, all forms [1]	2	(2)	
Iron and steel:			
Scrap	6	13	West Germany 11.
Primary forms and semimanufactures [1]	721	3,890	Guatemala 2,185; Nicaragua 938; Honduras 523.
Silver: Metal and alloys troy ounces	26,299	2,669	All to United States.
Zinc, all forms	------	62	Nicaragua 59.
Other nonferrous metals, including scrap	76	104	West Germany 55; United States 40.
Nonmetals:			
Cement:			
Asbestos	1,650	1,552	Honduras 1,070.
Portland	3,355	3,087	Honduras 3,084.
Clay and clay products:			
Common brick	58	1,490	Mainly to Honduras.
Refractories	-----	3	Mainly to Guatemala.
Fertilizers, manufactured	12,194	19,525	Guatemala 17,258.
Lime	130	57	Honduras 51.
Marble [1]	24	27	All to Honduras.
Salt	7,266	4,813	Honduras 2,718; Guatemala 1,976.
Stone:			
Dimension	24	139	Mainly to Nicaragua.
Industrial	(2)	-----	
Other nonmetallic minerals	------	54	Destination not listed.
Mineral fuels:			
Petroleum:			
Refinery products	155,500	110,049	Costa Rica 57,670; Honduras 45,279.
Gas liquids	1,418	1,499	Guatemala 835; Honduras 652.

[1] Includes reexports of "nationalized" goods, defined as those materials upon which duties have been paid.

[2] Less than ½ unit.

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Table 9.—El Salvador: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys:			
Unwrought	703	855	All from United States.
Semimanufactures	627	896	United States 317; West Germany 153.
Copper and alloys:			
Sulfate	5	4	United Kingdom 3.
Metal, all forms	991	1,737	United States 1,425.
Iron and steel:			
Pig iron, ferroalloys, and scrap	694	785	Honduras 477; United States 206.
Ingots and other primary forms	5,412	19,769	West Germany 9,536; Belgium 9,245.
Semimanufactures	45,795	57,562	Belgium 18,997; United States 9,493; Japan 5,314.
Lead and alloys:			
Unwrought	47	114	United States 69; Mexico 32.
Semimanufactures	227	217	Belgium 83; United States 35.
Platinum-group metals, troy ounces	64	NA	
Silver and alloys, do	6,398	5,466	United States 2,283; France 1,833.
Tin and alloys:			
Unwrought, long tons	6	4	Netherlands 3; United States 1.
Semimanufactures, do	22	24	United Kingdom 21.
Zinc and alloys, all forms	57	485	Japan 400; West Germany 51.
Nonmetals:			
Abrasives, natural:			
Diamond, industrial, carats	155,000	65,000	All from United States.
Pumice, emery, and corundum	5	10	United States 5; West Germany 2.
Asbestos: Crude, washed or ground	794	1,241	Mainly from Canada.
Cement:			
Asbestos	668	867	Guatemala 455; Honduras 340.
Portland	93,206	39,579	Honduras 21,865; Guatemala 11,998.
Clay and clay products:			
Kaolin and clayey earths	698	747	United States 548; Guatemala 170.
Refractory earths and rocks	53	42	Mainly from United States.
Common brick	17	18	Mainly from Guatemala.
Refractory brick	1,192	776	United States 424; Austria 123.
Diatomite	367	412	United States 233; Guatemala 120.
Feldspar, fluorspar and cryolite	2	3	Mainly from United States.
Fertilizer:			
Nitrogenous	74,840	57,850	Netherlands 17,107; Netherlands Antilles 14,816; West Germany 14,490.
Phosphatic	15,765	24,085	United States 22,884.
Potassic	3,894	4,006	All from United States.
Mixed	29,908	31,745	United States 14,259; West Germany 12,397.
Graphite	1	7	United States 4; Italy 2.
Gypsum:			
Crude	2,788	2,023	Mainly from Honduras.
Calcined, powder	62	67	United States 33; West Germany 21.
Lime, all types	619	1,279	Guatemala 725; United States 437.
Marble	1,178	1,431	Guatemala 1,229; Italy 153.
Mica	2	6	All from United States.
Salt, all types	4,249	2,182	Mainly from Honduras.
Sand, gravel, and crushed rock	12	32	Guatemala 15; Italy 10.
Sodium carbonate	337	276	West Germany 130; United States 69.
Sodium hydroxide	2,592	2,902	Netherlands 1,349; Belgium 578; United States 487.
Stone:			
Dimension	1,164	19	Mainly from Honduras.
Industrial	51	791	Mainly from Guatemala.
Sulfur	40	5,577	United States 3,628; Netherlands Antilles 1,903.
Talc	75	126	United States 70; United Kingdom 23.
Other nonmetallic minerals	354	685	Mainly from United States.
Mineral fuels:			
Coal, coke and briquets, all types	363	331	West Germany 299.
Mineral tars and products	96	-----	
Natural gas liquids	1,075	678	Venezuela 556.
Petroleum:			
Crude and partly refined	310,226	492,594	All from Venezuela.
Refinery products	24,960	16,992	United States 5,063; Guatemala 8,034; Netherlands Antilles 3,315.

NA Not available.
Source: Anuario Estadístico Centroamericano de Comercio Exterior—1966. SIECA. Jan. 1968. 798 pp.

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COMMODITY REVIEW

Metals.—*Iron and Steel.*—Acero, S. A., announced the inauguration of its rolling mill in July 1966. The plant, located in Zacatecoluca, has an annual capacity of 40,000 tons and in 1967 produced 21,243 tons of rolled products. Provision has been made for expansion to 100,000 tons annually if such capacity is warranted.

Siderúrgica Salvadoreña, S.A., El Salvador's other rolling mill, produced 2,874 tons of products in 1967. Production consisted chiefly of steel reinforcing rods in the range of ¼-inch to 1½-inch diameter, and small shapes.

Nonmetals.—*Salt.*—In early 1967 a new salt iodization plant was opened at La Pavana, near La Unión. Annual processing capacity was reported at 2,300 tons.

Mineral Fuels.—*Petroleum.*—Refineria Petrolera Acajutla, S.A., owned 65 percent by Standard Oil Co. of New Jersey and 35 percent by a member of the Royal Dutch-Shell Group, operated at a slightly increased volume in 1967 compared with 1966.

GUATEMALA

Guatemala's small mineral producing industry chiefly supplied the local market and provided a small surplus for export in 1967. Demand for industrial minerals in late 1966, and for part of 1967, was slack. The importance of precious and base metal output has declined in recent years. However, there are prospects for industry development as a result of mineral surveys in progress during 1966 and 1967. Considerable field activity that may lead to the development of sulfur and petroleum resources was reported.

The United Nations Special Fund was engaged in a mineral survey in cooperation with the Guatemalan Government. Exploration efforts were planned in the Departments of Chiquimula, Zacapa, El Progreso, Jalapa, Huehuetenango, and El Quiche. Total cost of the 3-year project is budgeted at $1,189,000 [7] of which the United Nations will contribute $719,000.

The West German Government provided four fulltime technicians to conduct a 3-year geological survey in cooperation with the Instituto Nacional de Geographia. The German contribution was reported at $200,000 for the 3-year term. Survey efforts were to be concentrated in the Departments of Alta Verapaz, Baja Verapaz, and Izabal.

On January 20, 1967, certain deposits of sulfur, iron ore, and bauxite were decreed in the National Reserve. This action, however, pertained only to certain states, and concessions already granted, or under application, were not affected. The decree applied to deposits lying on the continental shelf as well as on land. Applications for concessions lying in the National Reserve can be granted by the Ministry of Economy. It is presumed that the Government planned to evaluate the deposits in order to be in a more knowledgeable position when concessions are awarded to future applicants.

Decree Law 342, published in the Official Gazette of March 9, 1967, embodies the Regulations for the Application of the Mining Code. In addition to clarifying how, and by which government bodies, the Mining Code shall be administered, Chapter VII specifies that in cases where Guatemalans have equal ability and competence, they are to have employment preference over foreigners for up to 80 percent of the total work force, or up to the point where Guatemalan workers receive not less than 85 percent of the workers' payroll. In addition, employers shall also maintain training programs for the workers.

PRODUCTION

Mineral commodity output is mostly estimated, and in many cases incomplete. Many small producers are not canvassed for figures. However, reported output in 1967, in most cases, showed a rising volume in comparison with 1966 figures. The industrial minerals reported were consumed chiefly in the manufacture of cement and glass bottles.

The tungsten figures shown are quantities reportedly exported by W. R. Grace & Co., and are believed to refer to scheelite concentrate, reportedly containing 40 percent WO_3.

[7] Where necessary, values have been converted from Guatemalan quetzales (Q) to U.S. dollars at the rate of Q1=US$1.

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Details of petroleum refinery production were only partly reported; however, available figures for total refinery products show a rise in output of nearly 7 percent over 1966 output.

Table 10.—Guatemala: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Antimony, content of concentrate	[1] 28	------	------	14	30
Cadmium, in zinc concentrate—kilograms	7,100	15	17	866	NA
Copper concentrates	NA	NA	NA	NA	1
Iron ore [2]	6,000	7,000	8,469	10,000	10,200
Lead:					
Concentrate for export	([3])	1,207	923	901	1,160
Local smelter production	47	75	114	215	71
Silver—troy ounces	64,173	e 10,000	e 18,000	e 3,000	NA
Tungsten concentrate	NA	NA	NA	[4] 10	[4] 100
Zinc, concentrate	1,169	[4] 844	[4] 867	[4] 903	[4] 434
Nonmetals:					
Bentonite	NA	NA	NA	NA	29
Cement—thousand tons	157	186	e 231	202	224
Clays [2]	15,292	41,044	31,906	NA	NA
Diatomaceous earth	NA	NA	NA	NA	177
Dolomite	NA	NA	NA	700	1,640
Feldspar	NA	NA	NA	700	[5] 1,500
Gypsum [2]	14,794	7,101	9,393	12,000	11,400
Lime	NA	NA	r 17,972	17,000	[2] 18,550
Limestone—thousand tons	e 702	c 1,071	[2] 370	[2] 371	[2] 563
Mica—kilograms	------	------	10,000	17,000	------
Quartz [2]	11,001	21,936	28,431	26,000	34,298
Salt—thousand tons	19	18	15	r 20	NA
Silica	NA	NA	NA	NA	[5] 10,000
Talc	NA	NA	NA	NA	74
Volcanic ash	NA	NA	NA	[2] 28,000	44,286
Mineral Fuels: Petroleum refinery products:					
Aviation gasoline—thousand 42-gallon barrels	------	------	126	NA	NA
Motor gasoline—do	217	447	893	1,187	NA
Kerosine—do	36	76	210	316	311
Distillate fuel oil—do	116	251	719	1,139	2,123
Residual fuel oil—do	208	223	1,027	1,335	1,630
Liquefied petroleum gases—do	12	27	31	49	92
Total—do	589	1,024	3,006	[6] 4,204	[6] 4,498

e Estimate. r Revised. NA Not available.

[1] U.S. imports from Guatemala.

[2] Materials used in cement production. Figure for iron ore for 1967 includes 1,388 tons for unspecified use and 1,200 tons for use by glass manufacturer.

[3] Gross weight not reported and content of lead concentrates and zinc concentrates was 748 tons in 1963.

[4] Exports.

[5] Consumption by CAVISA, glass manufacturer.

[6] As reported.

TRADE

The United States is Guatemala's primary trading partner in terms of value of all commodities. In 1966, Guatemala's total commodity imports were valued at $206.9 million; of this total, value supplied by the United States amounted to $86.6 million; by El Salvador, $23.5 million; and by West Germany, $17.7 million. Of $226.1 million of exports in 1966, the United States received goods valued at $70.1 million, West Germany $30.3 million, and Japan $19.4 million.

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Table 11.—Guatemala: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Iron and steel:			
Scrap	3	33	United States 18; El Salvador 15.
Semimanufactures	986	4,223	Mainly to El Salvador.
Lead and alloys, all forms	76	16	All to El Salvador.
Lead, ore and concentrate	30	864	Mainly to Belgium-Luxembourg.
Nonferrous ore and concentrate	1,604	270	Mainly to United States.
Nonferrous metal and scrap, not elsewhere specified.	47	100	All to Spain.
Zinc, ore and concentrate	867	1,248	Belgium-Luxembourg 658; United States 590.
Nonmetals:			
Cement	44,147	9,677	Mainly to El Salvador.
Gypsum	39	12	Do.
Lime	1,197	946	Do.
Marble	1,692	2,016	Do.
Salt	2	17	Honduras 9; El Salvador 6.
Stone:			
Construction	------	24	All to El Salvador.
Industrial	637	833	Mainly to El Salvador.
Other nonmetal minerals	714	62	Honduras 21; El Salvador 16; Nicaragua 14.

Source: Anuario Estadístico Centroamericano de Comercio Exterior—1965, SIECA, Pub. 1966, 794 pp; 1966, SIECA, Pub. 1968, 798 pp.

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Table 12.—Guatemala: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys: Semimanufactures	834	618	United States 295; El Salvador 116.
Copper and alloys:			
Unwrought, electrolytic, powder	81	21	All from United States.
Semimanufactures	192	105	United States 22; Mexico 20; West Germany 16; El Salvador 13.
Sulfate	31	8	West Germany 5; United States 2.
Iron and steel:			
Pig iron and primary forms	(1)	9,856	Belgium-Luxembourg 6,559; France 2,000.
Scrap	1	(1)	Mainly from Panama.
Ferroalloys	(1)	(1)	All from El Salvador.
Semimanufactures	72,153	44,204	Belgium-Luxembourg 15,913; Japan 10,845; West Germany 5,051.
Castings and forgings	11	23	Mainly from El Salvador.
Other	1,381	------	
Lead and alloys, all forms	109	37	Costa Rica 16; United States 10.
Nonferrous base metals: Ores and concentrates.	1,007	751	Mainly from United States.
Silver and alloys, troy ounces	1,479	2,186	United States 1,315; West Germany 739.
Tin and alloys, all forms, long tons	49	29	Japan 12; United Kingdom 9.
Zinc and alloys, all forms	154	1,473	Mainly from Japan.
Nonmetals:			
Abrasives, natural:			
Diamond, industrial, carats	250,000	30,000	United States 15,000; Mexico 15,000.
Emery, pumice and corundum	5	6	Mainly from United States.
Asbestos, crude, washed or ground	999	554	Mainly from Canada.
Cement:			
Portland	1,497	1,490	Japan 733; West Germany 298; Denmark 265.
Asbestos	20	202	United Kingdom 151; El Salvador 27.
Clays:			
Kaolin and clayey earth	191	306	Mainly from United States.
Refractory earth and rocks	62	47	All from United States.
Ordinary brick	33	82	All from El Salvador.
Refractory brick	2,095	1,272	United States 1,050; Canada 107.
Diatomaceous earth	296	312	Mainly from United States.
Fertilizers:			
Nitrogenous	33,680	33,350	El Salvador 17,859; West Germany 5,805; United States 4,395.
Phosphatic	2,892	131	Netherlands 45; Mexico 20; United States 12.
Potassic	26,365	874	Mainly from West Germany.
Mixed	48,645	19,505	Netherlands 8,203; United States 6,358; West Germany 2,968.
Graphite	(1)	(1)	Mainly from Malagasy Republic.
Gypsum, calcined, powder	23	21	Mainly from United States.
Lime	7	24	United States 15; El Salvador 10.
Marble	123	------	
Mica, uncut	9	10	All from United States.
Quartz, crude	145	245	Mainly from United States.
Salt, rock or sea:			
Crude	1,524	978	Mainly from El Salvador.
Refined	3,072	1,107	Do.
Sand, gravel and crushed stone	9	9	Mainly from United States.
Sodium carbonate	191	1,062	West Germany 823; United States 240.
Sodium hydroxide	2,896	2,836	Mainly from United States.
Stone:			
Dimension	82	55	Mainly from El Salvador.
Industrial	61	30	Mainly from United States.
Sulfur, all forms	------	100	All from West Germany.
Talc	177	116	United States 83; France 18.
Mineral fuels:			
Asphalt, natural	159	3	All from United States.
Coal	61	47	West Germany 35; United States 12.
Coke	205	297	West Germany 170; United States 97.
Natural gas, all forms	9,718	11,214	Venezuela 6,291; United States 2,795.
Petroleum:			
Crude and partially refined	286,817	243,066	Mainly from Venezuela.
Refinery products:			
Gasoline	66,893	11,919	Mainly from Netherlands Antilles.
Kerosine	20,217	1,478	Panama Canal Zone 540; Netherlands Antilles 463; United States 379.
Diesel, gas oil, and others	119,991	125	United States 50; Mexico 26.
Lubricants, including greases	11,115	7,402	United States 4,861; Netherlands Antilles 1,599.
Paraffin, petrolatum and waxes	50	7,349	Mainly from United States.
Asphalt, coke, and others	420	12,288	Mainly from Venezuela.

[1] Less than ½ unit.

Source: Anuario Estadístico Centroamericano de Comercio Exterior—1965, SIECA, Pub. 1966, 794 pp. 1966, SIECA, Pub. 1968, 798 pp.

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COMMODITY REVIEW

Metals.—*Lead and Zinc.*—Compañía Minera de Guatemala, S.A., with a record of decreasing output and reserves, planned a small exploration program for 1967.

Small quantities of lead, zinc, antimony, and tungsten ores and concentrates are produced by individual miners throughout the Department of Huehuetenango. W. R. Grace & Co. buys ore from the small producers and in 1966 exported ores valued at around $45,000.

Ways to aid the small miners were being investigated by the Government of Guatemala. One plan under consideration was provision of a custom concentrating mill so that a more valuable product could be made available to the market.

Nickel.—Exploraciones y Explotaciones Mineras Izabal, S.A. (EXMIBAL) held by International Nickel Co., Inc. (80 percent) and Hanna Mining Co. (20 percent) continued evaluation of its nickel prospect near Lake Izabal. Arrangements were concluded to construct facilities at the port of Matias de Galvez for the handling of company shipments. Resolution of remaining problems may lead to the expenditure of over $100 million on a plant to produce 50 million pounds of nickel annually.

Basics, Inc., of Cleveland was reportedly in control of large concessions to the north of Lake Izabal. Examination to determine the feasibility of producing nickel and possibly magnesite, was continuing. Local interests were reported to be appraising a lateritic nickel deposit in the Department of El Quiche.

Nonmetals.—*Barite.*—Deposits that appear suitable for export are known near the town of Cubulco in the Department of Baja Verapaz, but lack of transportation has prevented economic marketing. Completion of the El Rancho-Cobán highway may improve the situation sufficiently to make production feasible. The deposits are said to be controlled by the Novella family, which produces Guatemala's cement.

Marble.—Guatemamarmol began output of marble for domestic consumption in 1965. Civil disburbances interrupted output during much of 1966, but operations at the quarry resumed in 1967. Scale of production was not divulged.

Mica.—Mica de Guatemala continued output from its properties near Tunajá in the Department of El Quiche during 1966 but reportedly shut down in 1967.

Sulfur.—Reports of prospecting activity and discovery of potentially valuable sulfur deposits indicate future possibilities for output. The sulfur situation is somewhat confused at present, and no firm progress reports are available.

Mineral Fuels.—*Petroleum.*—In early 1967 the Ministry of Economy delivered six petroleum exploration concessions to a group composed of Texas Petroleum Co., Mobil Exploration Guatemala, Inc., and Guatemala Superior Oil Co. The concessions cover most of the Guatemalan Pacific Coastal area, both on-and offshore. Rights over the 2.7 million acres involved are for 6 years, extendable to 8 years.

Hanna Mining Co. was reported to have applied for a lease of 100 square miles in the Gulf of Honduras off San Francisco del Mar.

The department of Mines and Hydrocarbons held an auction in which 40 concessions were awarded to national firms. The concessions involved 2.2 million hecares and were located in the departments of El Petén and Alta Verapaz. An additional 40 concessions will be offered to foreign bidders at a later date.

HONDURAS

Mining in Honduras, while not significant on a world scale, is important to the country. The two largest metal mines were expanding facilities to increase base and precious metal output. Oil and metal prospecting programs were in progress, and the country's first oil refinery was nearing completion.

A road improvement and building program was underway that should increase demand for cement and construction materials as sand and gravel.

A new mining code was presented to the National Congress in 1967. About 60 percent of the articles were approved in the first two, of three, debates. Articles remaining to be debated concern taxation and a controlled system of exploration and exploitation. It was considered possible that the new law might be approved in 1968.

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PRODUCTION

Increased output of most metals and nonmetals, plus more favorable world prices for some commodities, continued to add value to the mineral industry of Honduras. The value of five most important mineral commodities produced in Honduras (lead, zinc, cadmium, silver, and cement) rose to $15.8 million [8] in 1967, 11.6 percent greater than the 1966 figure. Marble, quarried near San Pedro Sula, was reported for the first time.

Table 13.—Honduras: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Antimony	NA	NA	NA	59	NA
Cadmium, content of concentrates	87	105	97	109	113
Gold, troy ounces	3,070	3,401	4,090	4,274	[1] 5,924
Iron and steel semimanufactures	------	------	2,331	5,064	NA
Lead, content of concentrates	9,900	7,484	9,654	11,704	11,684
Silver, thousand troy ounces	[e] 3,164	3,220	3,671	3,734	4,009
Zinc, content of concentrates	10,730	8,568	11,126	12,393	13,086
Nonmetals:					
Cement	60,480	72,843	93,966	105,020	111,036
Gypsum	2,985	4,720	6,039	11,780	13,923
Lime, calcined [2]	544	916	840	NA	NA
Limestone	NA	118,114	115,215	153,430	153,765
Marble:					
Dimension, square meters	------	------	------	NA	18,000
Other	------	------	------	NA	24,000
Salt	[e] 10,000	[e] 10,000	[e] 10,000	[e] 10,000	23,484

[e] Estimate. NA Not available.
[1] Includes 535 troy ounces of placer origin.
[2] Consumption at El Mochito mine only.

TRADE

Imports of mineral commodities increased in 1966 as did imports of all commodities.

The United States held its position in 1966 as Honduras' chief trading partner, by value. The United States was the destination for 55.8 percent of all Honduran exports, and received most of the metallic mineral commodity exports, while most nonmetallic mineral exports were to neighboring Central American countries. The United States supplied 49.8 percent of all Honduran imports; these included a number of mineral commodities, but most of the sizable oil imports were from Central America, the Caribbean, and Venezuela.

The following tabulation shows the relative position of Honduran trade in minerals to total trade for 1965 and 1966:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	7.5	126.0	6.0
1966	9.0	144.1	6.2
Imports:			
1965	10.7	122.0	8.8
1966	17.2	149.0	11.5
Trade balance:			
1965	−3.2	4.0	XX
1966	−8.2	−4.9	XX

XX Not applicable.

[8] Where necessary, values have been converted from Honduran lempiras (L) to U.S. dollars at the rate of L1 equals US$0.50.

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Table 14.—Honduras: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Antimony	------	30	Mainly to United States.
Cadmium, in concentrate	------	513	All to United States.
Copper	5	5	Do.
Gold, troy ounces	4,291	11,876	NA.
Iron and steel, scrap and semimanufactures.	753	1,259	United States 669; Nicaragua 236.
Lead, ore and concentrate	r 10,506	8,252	All to United States.
Silver, all forms, thousand troy ounces	8,015	3,842	Mainly to United States.
Zinc, ores and concentrates	r 10,991	9,611	All to United States.
Other:			
Nonferrous ores and concentrates	35	------	
Nonferrous alloys and scrap	254	173	El Salvador 102; West Germany 42.
Nonmetals:			
Cement:			
Asbestos	741	416	El Salvador 293; Nicaragua 124.
Portland	32,259	27,124	El Salvador 20,405; British Honduras 6,448.
Gypsum	1,759	1,438	Mainly to El Salvador.
Lime	91	78	Do.
Marble	------	22	Do.
Salt	6,334	6,474	Nicaragua 3,698; El Salvador 1,986.
Stone:			
Dimension	------	13	Mainly to El Salvador.
Industrial, n.e.s	9	106	United States 83; El Salvador 23.
Other nonmetallic minerals	2,576	84	Nicaragua 53; El Salvador 29.

NA Not available. r Revised.

Sources: Annuario Estadístico Centroamericano de Comercio Exterior—1965. SIECA, Oct. 12, 1966. 794 pp.; Comercio Exterior de Honduras, 1966.

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Table 15.—Honduras: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys, all forms	225	492	El Salvador 193; United States 159.
Copper and alloys:			
Metal, all forms	50	34	United States 21; Mexico 13.
Sulfate	56	46	Mainly from United States.
Iron and steel:			
Pig iron	14	5	All from United States.
Scrap	3	2	Mainly from El Salvador.
Ingot and equivalent forms	4,016	5,979	Belgium 4,160; West Germany 1,005; United States 802.
Semimanufactures	22,460	17,916	United States 7,745; Belgium 3,228; West Germany 2,294.
Lead and alloys, all forms	57	81	Mainly from United States.
Nickel, all forms	1	(1)	Do.
Silver and alloys, troy ounces	2,958	5,916	Do.
Tin and alloys, long tons	2	4	Do.
Zinc and alloys	26	51	Belgium 20; United States 16; Japan 15.
Other: Nonferrous metals	5	5	Mainly from Guatemala.
Nonmetals:			
Abrasives:			
Corundum and emery	1	319	Mainly from Nicaragua.
Diamond, industrial, carats	------	5,000	All from United States.
Asbestos	712	334	Mainly from Canada.
Cement:			
Asbestos	1,638	1,215	Mainly from El Salvador.
Portland	4,169	4,225	El Salvador 3,026; Denmark 579; West Germany 217.
Clay and clay products:			
Kaolin	32	214	Mainly from United States.
Refractory and common	12	68	All from United States.
Brick:			
Nonrefractory	22	475	Mainly from United States.
Refractory	382	788	Do.
Diatomaceous earth	107	84	Do.
Fertilizers:			
Nitrogenous	21,060	15,898	Netherlands 6,400; West Germany 4,675; Trinidad and Tobago 3,935.
Phosphatic	3,006	2,077	United States 1,663; Nicaragua 386.
Potassic	6,265	7,850	West Germany 5,607; Trinidad and Tobago 1,842.
Mixed	1,907	1,018	Mainly from El Salvador.
Graphite	4	(1)	All from El Salvador.
Gypsum:			
Crude	7	(1)	All from West Germany.
Calcined	19	28	Mainly from United States.
Lime, all types	299	740	United Kingdom 573; United States 128.
Marble	47	106	El Salvador 58; Guatemala 31; Spain 17.
Quartz	29	26	Mainly from United States.
Salt	2,371	3,284	El Salvador 2,896; United States 340.
Sodium carbonate	120	104	United Kingdom 65; West Germany 33.
Sodium hydroxide	643	1,144	West Germany 517; Netherlands 287; United Kingdom 214.
Stone:			
Industrial, not specified	7	1	All from United States.
Sand, gravel, crushed rock	38	45	Mainly from United States.
Sulfur	321	294	United States 140; France 99; West Germany 54.
Talc, natural or ground	34	53	Italy 29; United States 20.
Mineral fuels:			
Coal	77	150	United States 100; West Germany 50.
Coke	10	30	West Germany 20; Netherlands 10.
Mineral tar and products	245	3,528	Mainly from United States.
Natural gas liquids	1,396	1,949	Mainly from Venezuela.
Petroleum:			
Crude and partly refined	69,913	133,720	Netherlands Antilles 95,617; Venezuela 21,831; Trinidad and Tobago 14,774.
Refinery products:			
Gasoline	49,458	54,607	El Salvador 27,320; Netherlands Antilles 20,057.
Kerosine	17,060	19,941	El Salvador 9,285; Netherlands Antilles 5,778; Jamaica 4,380.
Distillate fuel oil	91,496	99,904	Netherlands Antilles 38,129; El Salvador 34,309; Jamaica 21,435.
Lubricants, including greases	3,623	3,736	United States 2,414; Netherlands Antilles 508; Jamaica 460.
Paraffin, petrolatum, and waxes	798	753	Mainly from United States.
Asphalt and coke	2,342	2,005	Netherlands Antilles 1,618; Venezuela 271; United States 115.

[1] Less than ½ unit.

Source: Annuario Estadístico Centroamericano de Comercio Exterior—1965. SIECA, Oct. 12, 1966. 794 pp. Comercio Exterior de Honduras, 1966.

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COMMODITY REVIEW

Metals.—*Cadmium, Gold, Lead, Silver, Zinc.*—El Mochito mine of the New York and Honduras Rosario Mining Co. expanded operations for the 13th consecutive year. In 1967, 17 percent more ore was mined and processed than in 1966. Production at El Mochito in 1967 was as follows, with the comparative figure for 1966 shown in parentheses: silver 3,804,318 ounces (3,513,601); gold, 5,288 ounces (4,274); lead 10,373 metric tons (9,718); zinc, 11,601 metric tons (10,997); cadmium, 100 metric tons (99). Increased percentage of mill recovery was shown for lead and zinc, but slight decreases in recovery were experienced for silver and gold.

Assured and probable reserves of ore on December 31, 1967, stood at 1,146,851 tons; average assays of the reserve were determined at 16.7 ounces of silver per ton, 0.017 ounce of gold per ton, lead 7.28 percent, and zinc 7.33 percent.

Capital equipment expenditures in 1967 amounted to $599,000; the budget for 1968 provided $775,000 for capital projects.

New York and Honduras Rosario Mining Co. reportedly plans to reactivate its El Rosario and San Juancito mines.[9] The mines, closed some years ago, were principally silver producers with minor amounts of gold and other metals.

The Inter-American Corporation of Honduras claimed discovery of potentially rich copper and lead deposits in the Department of Santa Barbara.

Mina Moramulca, in the extreme northwest of the Department of Choluteca, was producing in 1968, and may have started operations in late 1967. Output was estimated at 85 tons of gold and silver ore daily. Ore minerals were reported to be argentite and free gold in a quartz matrix.

Mineral Fuels.—*Petroleum.*—Texaco Caribbean, Inc., obtained official approval in 1966 to build a refinery at Puerto Cartes. The refinery is licensed to operate for 40 years and the contract includes the rights to warehouse, sell, distribute, and reexport products subject to conditions stipulated in the Petroleum Law.

Initial capacity is planned for the processing of 5,800 barrels of crude oil daily. Cost of the installation is put at $8 million. National capital reportedly will participate in the enterprise to the extent of 33⅓ percent.[10] It is expected that initial operations will start in 1968.

In late 1967 the Ministry of Communications and Public Works was authorized to regulate petroleum product prices. A law was also passed that put a 1-centavo ($0.005) consumer tax on all locally produced petroleum products. The consumer tax will offset the loss of import revenue resulting from forthcoming domestic refining.

Honduras has attracted a number of companies that have taken offshore exploration concessions. Reductions have been made in leased onshore acreage, but the Caribbean continental shelf areas are nearly completely under lease from north of San Pedro Sula at about 88 degrees west longitude, eastward to 80 degrees west longitude.

In early 1967 Signal Exploration (Honduras) Co. obtained a concession of 900,000 hectares offshore from the Department of Gracias a Dios. Some seismic work was completed.

NICARAGUA

Nicaragua's mineral output potential continued to be of interest. Exploration was carried on by various organizations for metals and petroleum. Development of the few producing properties was progressing and copper, particularly, may become of greater importance. U.S. and Canadian interests dominated the metal mining sector of the industry.

The report of the results of the cooperative study carried on by the Government of Nicaragua and the United Nations Special Fund was released in late 1966. Titled "Geografía Física y Recursos Mineros de Nicaragua" the report was made available to the public and created considerable interest. Total cost of the survey was reported at $1.4 million,[11] of which the Special Fund contributed $799,000.

[9] Engineering and Mining Journal. October 1967. p. 180.

[10] Comercio Exterior de Mexico. v. 12. No. 6, June 1966, p. 17.

[11] Where necessary, values have been converted from Nicaraguan córdobas (C$) to U.S. dollars at the rate of C$7=US$1.

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PRODUCTION

Metallic mineral output decreased in quantity in 1967, but value increased modestly because of favorable world prices. Based on incomplete data, output of oil refinery products increased 17 percent over the 1966 level. The sharp rise in cement output can be attributed to increased local demand, stemming largely from an aggressive roadbuilding program; exports declined.

La Luz Mines, Ltd., produced less gold and silver from its La Luz property because of heavy rains and floods that forced the mining of the more readily available lower grade ores. In addition, because of a power shortage, the company decided to maintain maximum output at its Rosita copper-gold-silver deposit because of the more profitable return. Thus, tonnage of ore milled at Rosita was increased at the expense of operations at La Luz.

Table 16.—Nicaragua: Production of mineral commodities
(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Copper concentrate, metal content	7,283	9,240	r 10,187	9,764	9,336
Gold, troy ounces	204,769	225,581	198,152	199,108	177,702
Silver, do	405,252	332,370	380,377	446,706	372,371
Nonmetals:					
Cement	53,812	61,052	65,859	84,349	95,924
Gypsum	2,500	5,500	5,000	9,000	10,000
Lime [1]	28,404	26,392	26,717	27,085	NA
Limestone [1], thousand tons	140	148	157	200	NA
Salt, marine	16,495	17,319	17,582	19,017	NA
Mineral fuels: Petroleum refinery products:					
Motor gasoline, thousand 42-gallon barrels	399	606	674	743	803
Kerosine and jet fuel, do	116	163	152	169	218
Distillate fuel oil, do	240	404	471	506	603
Residual fuel oil, do	371	583	308	450	561
Liquefied petroleum gas, do	11	18	27	36	46
Total, do	1,137	1,774	1,632	1,904	2,231

r Revised. NA Not available.
[1] For cement and lime production only.

TRADE

There was little change in Nicaragua's pattern of trade in 1966 compared with that in 1965. Copper ores and concentrates valued at $7.2 million represented 5.06 percent of the value of all exports and was the fifth most valuable export commodity; gold was the sixth most valuable commodity exported. In 1964, however, gold was the fourth most valuable export, followed by copper in seventh place.

Imports of all commodities rose somewhat in 1966 and, in combination with exports of lower value, widened the trade balance compared with that of 1965. Petroleum products and iron and steel semimanufactures were the most costly imports, valued at $7.8 million and $7.3 million respectively. In terms of value, the United States was the primary source of Nicaragua's total imports, followed by West Germany and Costa Rica. Japan was the primary export destination, followed by the United States and West Germany.

The following tabulation shows the relationship between total trade and trade in minerals for 1965 and 1966:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	7.0	148.9	4.7
1966	8.9	142.2	6.3
Imports:			
1965	26.3	160.3	16.4
1966	23.0	181.9	12.6
Trade balance:			
1965	−19.3	−11.4	XX
1966	−14.1	−39.7	XX

XX Not applicable.
Source: República de Nicaragua. Recaudación General de Aduanas. Memoria 1966 Managua, Nicaragua, 1967 286, pp.

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Table 17.—Nicaragua: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Copper concentates, gross weight	40,229	43,268	All to Germany.
Gold, bars and ingots troy ounces	140,016	147,829	Canada 59,575; United States 58,836.
Iron and steel:			
Ingots and semimanufactures	2,761	3,655	El Salvador 1,634; Costa Rica 831; Honduras 605; Guatemala 585.
Scrap	------	214	Germany 146; Japan 32; Netherlands 18.
Silver, bars and ingots troy ounces	403,267	447,956	Mainly to United States.
Zinc, all forms	53	159	Costa Rica 66; Guatemala 38; El Salvador 35; Honduras 20.
Other nonferrous metals and scrap	66	5	All to Costa Rica.
Nonmetals:			
Cement	782	182	All to Honduras.
Clay, common	141	77	All to Costa Rica.
Gypsum, natural and calcined	5,134	----	
Lime	3	1	Do.
Salt	389	1,059	Do.
Stone, industrial use	7	6,314	Mainly to Costa Rica.

Source: República de Nicaragua. Recaudación General de Aduanas. Memoria 1966. Managua, Nicaragua, 1967. 286, pp.

Note: Source does not distinguish between East Germany and West Germany.

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Table 18.—Nicaragua: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys: Semimanufactures	408	757	United States 394; El Salvador 204.
Copper and alloys:			
Metal, semimanufactures	135	133	Canada 35; United States 31; United Kingdom 25.
Sulfate	20	30	United States 24; Netherlands 4.
Iron and steel:			
Scrap	------	9	All from El Salvador.
Pig iron	(1)	11	All from Germany.
Ingots and equivalent primary forms.	33	146	Belgium 134; United Kingdom 10.
Semimanufactures	42,506	44,432	Belgium 15,614; Germany 8,713; Japan 4,653; Costa Rica 3,709; Netherlands 3,505; United States 3,134.
Lead and lead alloys, all forms	142	236	United States 86; Netherlands 29; Denmark 28; Canada 25.
Silver and alloys, all forms_troy ounces	7,234	6,334	Mainly from United States.
Tin and alloys, all forms_____long tons	18	47	United Kingdom 22; Canada 11.
Zinc and alloys, all forms	1,753	1,317	Mainly from Costa Rica.
Other nonferrous minerals, metals, and scrap.	r 10	6	Costa Rica 2; United States 2; Honduras 2.
Nonmetals:			
Abrasives, natural	2	2	All from United States.
Asbestos	------	70	United States 38; United Kingdom 11; Canada 9.
Cement:			
Asbestos	2,303	3,064	Costa Rica 1,782; El Salvador 499.
Portland	10,762	9,652	Costa Rica 7,561.
Clay and clay products:			
Common and refractory	257	875	United States 549; United Kingdom 314.
Common brick	68	625	Japan 366; Costa Rica 83; United States 71.
Refractory brick	186	569	United States 341; Costa Rica 111.
Fertilizers:			
Nitrogenous	22,911	18,860	Trinidad 6,298; Venezuela 3,481; Italy 2,719; Costa Rica 1,953.
Phosphatic	11,479	14,905	United States 11,120; Costa Rica 3,704.
Potassic	4,453	2,633	United States 2,135; Costa Rica 498.
Mixed	4,935	3,743	United States 2,691; Italy 635.
Graphite	2	4	Germany 3; United States 1.
Lime, all types	189	2,115	United States 1,586; United Kingdom 508.
Mica	1	1	All from Germany.
Phosphates, natural	------	8	Costa Rica 5; Germany 2.
Salt	2,690	4,027	Honduras 3,731; United States 222.
Sand, gravel, and crushed rock	4	29	Mainly from United States.
Sodium carbonate	240	375	United States 153; Germany 116; United Kingdom 84.
Sodium hydroxide	1,719	2,607	United States 1,239; United Kingdom 799; Germany 419.
Stone:			
Dimension	58	173	Guatemala 86; Italy 62.
Industrial	112	54	Germany 21; Honduras 20; United States 11.
Sulfur	51	313	Mainly from United States.
Mineral fuels:			
Asphalt, natural	3	3	All from Mexico.
Coal	16	25	All from United States.
Coke	77	84	Germany 74; United States 10.
Mineral tars and products	4,952	8,355	United States 5,810; Venezuela 2,355.
Natural gas liquids	1	203	El Salvador 128; Costa Rica 67.
Petroleum:			
Crude and partially refined thousand 42-gallon barrels	1,260	1,812	Mainly from Venezuela.
Refinery products:			
Gasoline_____do	97	128	Mainly from Netherlands Antilles.
Kerosine_____do	15	33	Do.
Fuel oil, all types_____do	54	104	Do.
Lubricants including greases	5,887	5,476	Mainly from United States.
Paraffin, petrolatum, and waxes	241	1,380	Do.
Asphalt and coke	NA	8,838	Venezuela 6,000; Costa Rica 2,241; United States 593.

r Revised. NA Not available.
1 Less than ½ unit.
Source: República de Nicaragua, Recaudación General de Aduanas. Memoria 1966. Managua, Nicaragua, 1967. 286 pp.
Note: Source does not distinguish between East Germany and West Germany.

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COMMODITY REVIEW

Metals.—*Gold and Base Metals.*—The Neptune Gold Mining Co. carried out additional diamond drilling along the Vesubio vein giving estimated reserves of about 1.25 million tons of gold-copper-lead-zinc ore, and as a result, planned to spend $1 million to help build an all-weather road from the mine (near Bonanza) to Puerto Cabezas. It was also planned to convert part of the cyanide plant to a flotation mill.

La Luz Mines, Ltd., produced 9.766 tons of copper in concentrates during the fiscal year ended September 30, 1967, an increase of 304 tons over that of the previous fiscal year. The Rosita mine accounted for 9,474 tons of the output. Gold and silver output decreased for the year because of operating difficulties caused by floods, particularly at the La Luz mine.

Positive and probable ore reserves at La Luz were put at 3.7 million tons running 0.093 ounce of gold per ton in September 30, 1967. Proven and possible reserves at Rosita totaled 656,900 tons averaging 2.70 percent copper and 0.072 ounce of gold per ton. Possible ore was reported at 199,600 tons averaging 1.51 percent copper and 0.042 ounce of gold per ton.

Fertilizer Materials.—Interiore de Centro América S.A., owned on a 50–50 basis by Occidental Petroleum Corp. and local interests, completed its mixed fertilizers plant near Corinto in 1966. Costing about $5 million, the plant has a capacity of 75,000 tons annually. The plant operates on imported materials. Output data has not been released.

Mineral Fuels.—*Petroleum.*—There were press reports of oil and gas indications in Nicaragua but there have been no announcements of substantial discoveries. Considerable interest has been shown by a number of companies in the possibility for discovery of offshore oil. At the beginning of 1966 about 1.2 million hectares was held in concessions, but by the beginning of 1967, some 4.2 million hectares was held, with new applications pending for an additional 1.5 million hectares. The continental shelves of both coasts were largely under lease, but activity seemed to be concentrated on the Caribbean side. Five companies were active in surface geological and offshore geophysical work.

PANAMA

Panama's extraction of minerals was limited to a very few commodities, chiefly construction materials. Oil refining and metal-forming industries operated on imported raw materials. Value of primary output was not available; however, a sum of $20 million [12] was attributed to value of production of the metal and nonmetal fabricating industries in 1965, exclusive of petroleum refining, and value in 1967 presumably was somewhat higher because of increased production.

Available information suggests that about 2,000 persons are employed in the mining and metal processing industry in Panama.

A Cadastral Survey was in progress, and the first group of maps was completed in 1966.

Some import restrictions were imposed in 1967 to protect local industry. At the request of Ingeniería Amado, S.A., the only aluminum extrusion plant in Panama, the Panama Office of Price Control restricted imports of aluminum profiles to not more than 30 percent of the 1963 and 1964 import levels. Aluminum corrugated roofing sheet imports were restricted to not more than 20 percent of 1965–66 levels. At the request of Cil-Gas, S.A., the Office of Price Control also limited the imports of tanks used to contain household cooking gas to 50 units per month in the 10-, 25-, and 30-pound sizes.

With the promulgation of Executive Resolution No. 8A on March 2, 1966, the Government of Panama took steps for the reversion of certain gold and coal concessions to the State. Concessions granted before March 1, 1946, would, under certain circumstances, revert at the end of 20 years. About 39 concessions were affected, and the lands became available for new applications.

A United Nations Special Fund minerals survey in cooperation with the

[12] Where necessary, values have been converted from Panamanian balboas (B) to U.S. dollars at the rate of B1 equals US$1.

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Panama Government was started in 1966. Aerial geophysical work was completed in 1966. Geochemical studies and investigation of anomalies proceeded in 1967. The U.N. work was scheduled to end in October 1968. Costing $1.4 million, the survey was planned to enlarge on a previous study made by the Agency for International Development which found indications of copper resources that could prove to be exploitable.

PRODUCTION AND TRADE

Output of most ordinary building materials are usually only privately recorded in Panama. Thus, figures are not available for sand, gravel, crushed rock, and other miscellaneous material.

Petroleum refinery production continued to increase in 1966, but output of metal shapes and nonmetallic minerals was mixed compared with output in 1965.

Panama's chief mineral commodity imports in 1966 were crude oil and products valued at $47.5 million, followed by iron and steel products valued at $6.1 million. Exports and reexports are largely confined to refinery products and scrap metal.

The United States remained Panama's chief trading partner, having supplied 41 percent of all imports and having taken 68.4 percent of exports and reexports in 1966. Venezuela supplied 21.2 percent of Panama's imports in 1966, largely crude oil.

The following tabulation shows the relation of mineral trade to total trade for 1965 and 1966:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	24.5	70.2	34.9
1966	26.5	79.6	33.3
Imports:			
1965	50.3	189.6	26.5
1966	54.2	214.5	25.3
Trade balance:			
1965	−25.8	−119.4	XX
1965	−27.7	−134.9	XX

XX Not applicable.

Note: 1966 figures are preliminary.

Table 19.—Panama: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1962	1963	1964	1965	1966
Metals: [1]					
Aluminum extrusions, pipe, tubes, bars, etc	-------	45	360	338	e 630
Steel reinforcing rods and small shapes [2]	e 4,000	6,350	12,500	11,000	e 13,000
Nonmetals: [3]					
Asbestos cement	NA	e 545	409	978	e 700
Cement	122,406	141,713	125,178	165,640	149,817
Clay and shale	e 35,000	e 35,000	43,227	133,707	4 40,844
Limestone and siltstone, for cement	e 210,700	217,748	e 211,700	208,991	124,696
Salt	r 11,394	10,229	11,181	11,648	8,922
Mineral fuels: Petroleum refinery products:					
Motor gasoline thousand 42-gallon barrels	1,192	2,241	2,047	2,445	2,920
Jet fuel do	30	200	375	377	683
Kerosine do	628	524	581	770	586
Distillate fuel oil do	1,381	4,398	4,525	3,235	6,350
Residual fuel oil do	3,119	6,368	6,714	6,378	8,699
Other do	307	NA	367	3,225	574

e Estimate. r Revised. NA Not available.
[1] Fabricated or processed from imported raw materials.
[2] Fiscal year ending Oct. 31.
[3] Panama also produces sand, gravel and crushed rock.
[4] For cement production only.

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Table 20.—Panama: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Exports:			
Metals:			
Iron and steel:			
Scrap	-----	23	All to United States.
Primary forms	-----	1	All to Costa Rica.
Semimanufactures	123	(1)	All to Colombia.
Nonferrous scrap	r 1,232	1,116	United States 410; Japan 306; Italy 176; Spain 140.
Nonmetals: Cement	r 5,440	-----	
Mineral fuels: Petroleum refinery products, thousand 42-gallon barrels	8,599	9,470	United States 2,801; Panama Canal Zone 2,470; Canada 1,980; Japan 749; United Kingdom 413.
Reexports:			
Metals:			
Copper sulfate	(1)	-----	
Iron and steel: Semimanufactures	5	5	Mainly to Costa Rica.
Mineral fuels: Refinery products:			
Diesel oil, 42-gallon barrels	-----	545	All to British Honduras.
Lubricants including greases, do	254	42	Mainly to Costa Rica.

r Revised.
1 Less than ½ unit.

Source: República de Panamá, Contraloria General de la República, Dirección de Estadística y Censo.

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Table 21.—Panama: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metal:			
Aluminum and alloys, all forms	r 1,367	1,989	United States 1,238; United Kingdom 1,180.
Copper and alloys:			
Sulfate	7	16	Mainly from United States.
Semimanufactures	r 191	207	United States 81; Canada 72; Mexico 34.
Iron and steel:			
Pig, scrap and ferroalloys	2,567	491	Mainly from Panama Canal Zone.
Primary forms	12,151	9,680	Belgium-Luxembourg 6,118; West Germany 3,554.
Semimanufactures	31,224	34,927	United States 11,858; Japan 6,982; Belgium-Luxembourg 4,060; West Germany 2,103.
Lead metal, all forms	214	225	Mainly from Denmark.
Platinum and platinum group metals. troy ounces	515	129	All from United States.
Silver, bars, ingots, sheets do	9,999	12,700	Mainly from United States.
Tin metal, all forms long tons	37	15	Netherlands 7; West Germany 6.
Zinc metal, all forms	------	2	All from United States.
Other nonferrous metals kilos	762	219	Do.
Nonferrous scrap	47	63	Mainly from Panama Canal Zone.
Nonmetals:			
Asbestos, raw, washed, or ground	1	49	Mainly from Canada.
Abrasives:			
Emery, corundum, pumice	8	1	Mainly from United States.
Industrial diamonds carats	------	5,000	All from United States.
Cement	3,074	4,055	United Kingdom 1,491; France 810.
Clays:			
Unprocessed	338	406	Mainly from United States.
Refractory bricks	541	514	Do.
Fertilizers:			
Crude:			
Phosphate rock	------	(1)	All from United States.
Sodium nitrate	1	139	All from Chile.
Manufactured:			
Nitrogenous	22,847	12,505	West Germany 7,665; Netherlands 3,374.
Phosphatic	1,658	1,910	Mainly from Netherlands.
Potassic	1,029	161	West Germany 119; United States 41.
Mixed	5,089	8,701	Costa Rica 4,802; United States 2,265; El Salvador 617; Netherlands 608.
Gypsum:			
Crude	5,277	5,004	Mainly from Dominican Republic.
Calcined	41	1,377	Mainly from Jamaica.
Infusorial earth, not as abrasive	98	148	Mainly from United States.
Lime	824	786	United Kingdom 447; United States 333
Marble, block and ground	318	400	Mainly from Italy.
Mica, untrimmed	5	6	Mainly from United States.
Quartz, crude	2	74	Do.
Salt, all types	294	293	United States 165; Dominican Republic 100.
Sand	6	4	All from United States.
Sodium carbonate	245	248	United Kingdom 146; United States 55; France 40.
Sodium hydroxide	987	1,137	United States 887; United Kingdom 114; West Germany 65.
Stone: Dimension, worked and unworked	179	299	Mainly from Canada.
Sulfur	7	6	Netherlands 3; Belgium-Luxembourg 2.
Talc	181	248	Mainly from United States.
Mineral fuels:			
Coal, coke, briquets	221	1,872	United States 1,670; West Germany 192.
Mineral tar	9	8	Panama Canal Zone 6; United Kingom 2.
Petroleum:			
Crude and partially refined thousand 42-gallon barrels	16,985	20,328	Mainly from Venezuela.
Refinery products:			
Motor gasoline do	4	4	Mainly from Costa Rica.
Kerosine do	8	4	Panama Canal Zone 2; Colombia 2.
Distillate fuel oil do	123	111	Mainly from Curaçao.
Residual fuel oil do	130	29	Panama Canal Zone 19; Curaçao 10.
Lubricants including greases	1,952	1,696	United States 1,088; Curaçao 366; Jamaica 148.
Other	1,693	1,405	Mainly from United States.

[1] Less than ½ unit.

Source: República de Panamá, Contraloria General de la República, Dirección de Estadística y Censo.

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COMMODITY REVIEW

Metals.—*Iron and Steel.*—Plans for Jamaican interests to take a share in a new company, Productora de Acero y Afines Asociada, S.A., and contract to purchase half of the firm's initial production did not materialize, and controlling interest was purchased by the Panamanian company, Cemento Panamá, S. A. Other shareholders are Overseas Management Co., S.A., composed of Panamanian and U.S. interests.

Originally planned annual output of 100,000 tons of steel products will be substantially reduced, and output is planned primarily for the domestic market. Construction of the plant had not commenced by yearend.

Manganese.—It was reported that Dravo Corp. of Pittsburgh was studying the feasibility of developing manganese deposits in the Rio Boquerón area.

Nonmetals.—*Fertilizers and Petrochemicals.*—Refinería Panamá, S.A., was granted permission to form a subsidiary, Petroquímica Panamá S.A., to build a petrochemical plant near Colón. Refinería's contract with the Government was extended for another 25 years, and the petrochemical contract was set for an equal time. Refinería will be allowed to sell feedstocks to Petroquímica free of all duty and taxes. The new petrochemical plant will require an investment of at least $35 million. Products will be fertilizers, plastics, industrial gases, carbon dissolvents, sulfur, resins, acids, alcohols, and other allied commodities.

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The Mineral Industry of Other South American Areas

By Burton E. Ashley [1]

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ECUADOR

Ecuador's mining industry is of little significance and its contribution to the gross national product in 1966 was estimated at not more than 2 percent. Value of production, excluding petroleum, was probably about $1 million, of which metal mining accounted for $802,000.

Recorded exports have been limited to some scrap, base metal concentrates, a few tons of gold ore and crude oil. Modest demands for most processed mineral commodities must be met by imports.

Discovery of apparently substantial oil deposits in northeast Ecuador was the most important event in the minerals field during recent years. The discovery will without doubt be of great benefit to the country economically, both as an income producer and as a means of saving foreign exchange.

A search for nonmetallic minerals such as phosphate rock and potash is expected to be carried on with the cooperation of the U.S. Agency for International Development. It is reported that this program will follow upon an extensive survey of natural resources in progress at yearend 1967. Preparation of geologic maps of the south central part of the country continued with the assistance of the United Nations Special Fund.

Decree 1208, which pertains to Ecuador's mining law, became effective on October 7, 1966, when it was published in Ecuador's Official Register Number 136.

In general, the Decree requires that entities desiring to carry out mineral ventures show technical and financial capability. A "finders fee" was provided for anyone discovering a prospect that he is unable to develop. The transfer of applications for concessions to third parties was prohibited while the applications were being processed. Rules pertaining to gold placers were modified in respect of lease size and fees payable. Details of the revision were published.[2]

PRODUCTION AND TRADE

Ecuadorian mineral production statistics for 1967 were not available in time for inclusion in this report. Crude oil output presumably again declined slightly and is expected to continue to fall until the newly discovered fields in the northeast are brought into production. No reliable basis for estimating 1967 output of other commodities is available.

The most recent available official Ecuadorian trade statistics cover 1965, and in that year mineral commodity trade by value (both exports and imports) increased with respect to that of 1964, although total imports declined. In 1965, the United States remained Ecuador's chief trading partner in terms of value. The relationship of mineral trade to total trade

[1] Physical scientist, Division of International Activities.

[2] Bureau of Mines. Mineral Trade Notes. V. 64, No. 2, February 1967, pp. 37–42.

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in 1964 and 1965 is given in the following tabulation:

	Value (thousand dollars)[1]		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1964	1,452	130,364	1.1
1965	2,976	r 131,971	2.3
Imports:			
1964	23,016	151,916	15.2
1965	31,448	r 144,164	21.8
Trade balance:			
1964	−21,564	−21,552	XX
1965	−28,472	−12,193	XX

r Revised. XX Not applicable.
[1] Where necessary, values have been converted from sucres (S/) to U.S. dollars at the rate of S/18=US$1.

Source: República del Ecuador, Comercio Exterior 1964. Junta Nacional de Planificación y Coordinación. División de Estadística y Censos. Anuario de Comercio Exterior. Volume 1, 1965.

COMMODITY REVIEW

Metals.—*Gold, and Nonferrous Base Metals.*—Gold prospects continued to generate some interest but there were no reports of significant discoveries.

Union Carbide Corp. was still assessing its concession in northern Esmeraldas province. Other smaller firms and individuals were active in exploration.

Compañía Industrial Minera Asociada, S.A. (CIMA), a quasi-Government organization located near Portovelo, continued to operate at a loss. Output of gold, silver, lead, copper, zinc, and cadmium continued to decrease. The operating efficiency of the mill could be improved but known ore reserves do not justify the necessary investment. The Banco de Fomento reported that it would consolidate CIMA's debts

Table 1.—Ecuador: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966
Metals:				
Cadmium, in zinc concentrate—kilograms	2,008	2,141	1,239	556
Copper, in concentrate	285	171	129	228
Gold, in concentrate—troy ounces	21,041	17,681	11,512	10,901
Lead, in concentrate	162	166	114	69
Silver, in concentrate—troy ounces	121,784	117,126	69,966	76,710
Zinc, in concentrate	358	380	236	135
Nonmetals:				
Cement	258,394	287,806	325,000	438,000
Clay, kaolin	379	208	218	891
Gypsum	NA	NA	NA	NA
Other	1	NA	NA	NA
Salt e	35,000	35,000	35,000	35,000
Sulfur	166	NA	232	125
Mineral fuels:				
Lignite	65	35	33	68
Petroleum: Crude—thousand 42-gallon barrels	2,465	2,796	2,850	2,660
Gasoline, natural—do	109	119	128	110
Refinery products:				
Gasoline—do	1,811	2,037	2,157	2,160
Kerosine and jet fuel—do	487	478	627	762
Distillate fuel oil—do	813	859	963	1,044
Residual fuel oil—do	1,167	1,296	1,480	1,501
Other—do	76	169	252	285
Total—do	4,304	4,839	5,479	5,752

e Estimate. NA Not available.
Source: U.S. Embassy, Quito.

Table 2.—Ecuador: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal destinations, 1965
Metals:			
Copper: Scrap	5	2	All to Venezuela.
Gold telluride-calaverite	5	5	All to United States.
Iron and steel:			
Scrap	52	65	Do.
Semimanufactures	-----	3	All to West Germany.
Lead concentrate	r 2,494	707	All to Belgium.
Zinc concentrate	864	562	Italy 345; France 217.
Mineral fuels: Petroleum, crude—thousand 42-gallon barrels	531	379	All to Argentina.

r Revised.
Source: República del Ecuador. Anuario de Comercio Exterior, 1965.

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Table 3.—Ecuador: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal sources, 1965
Metals:			
Aluminum:			
Oxide	17	5	West Germany 2; United States 2.
Unwrought and semimanufactures	527	667	United States 257; Austria 162; West Germany 94.
Copper, unwrought and semimanufactures.	553	657	Chile 269; Colombia 146; Canada 80.
Gold, unwrought and powder.	386 troy ounces	289	West Germany 225; United States 64.
Iron and steel:			
Pig iron	95	40	All from West Germany.
Ferroalloys	103	-----	
Ingots and other primary forms	15	217	West Germany 79; Belgium 75; Japan 40.
Semimanufactures	50,836	57,298	Belgium 30,146; France 7,288; West Germany 6,227.
Lead:			
Unwrought and semimanufactures	260	275	Mexico 98; United Kingdom 54; Peru 50.
Litharge	85	76	Mainly from Mexico.
Mercury	76-pound flasks 11	8	Mainly from United States.
Nickel	kilograms 1,290	1,066	United Kingdom 407; United States 322.
Platinum	troy ounces ------	64	United Kingdom 32; United States 32.
Silver	do 514	450	Italy 322; West Germany 128.
Tin, unwrought and semimanufactures.	long tons 26	26	Mainly from United Kingdom.
Zinc, unwrought and semimanufactures	53	78	Belgium 36; United States 22.
Other	3	3	West Germany 2; United States 1.
Nonmetals:			
Abrasives, natural	18	11	Mainly from West Germany.
Asbestos, crude, washed or ground	787	954	Mainly from Canada.
Barite	589	461	Mainly from Peru.
Cement	1,958	2,322	West Germany 1,385; Belgium 393; Denmark 311.
Chalk	417	417	Belgium 264; United Kingdom 56; Norway 54.
Clays:			
Bentonite	358	424	United States 329; Peru 95.
Kaolin	5	9	Mainly from United States.
Other	77	72	Do.
Diatomaceous earth	242	338	West Germany 165; United States 153.
Fertilizer materials:			
Nitrogenous	8,999	11,820	United States 5,324; West Germany 4,424.
Phosphatic	3,163	5,737	Mainly from United States.
Potassic	5,222	5,677	United States 4,511; West Germany 1,165.
Other	1,249	860	West Germany 449; Chile 200; Netherlands Antilles 200.
Graphite	2	3	Mainly from United States.
Gypsum	39	57	Do.
Magnesite, crude or calcined	11	12	West Germany 8; Netherlands 3.
Marble	138	98	Mainly from Italy.
Mica, all forms	15	27	Mainly from United States.
Potassium hydroxide	16	15	West Germany 7; Italy 7.
Salt	263	163	Mainly from United States.
Sand, including quartz	1,377	429	Do.
Sodium hydroxide	2,421	3,785	United States 1,952; West Germany 898.
Stone, building and ornamental	199	60	Italy 30; Peru 29.
Sulfur	136	151	Mainly from United States.
Talc	171	175	United States 88; Italy 68.
Other nonmetallic minerals	123	33	United States 15; West Germany 13.
Mineral fuels:			
Coal	175	314	Netherlands 241; United States 73.
Coke	278	160	Netherlands 82; Belgium 40.
Other solid hydrocarbons:			
Tar and pitch	132	104	All from United Kingdom.
Natural asphalt	2,053	9,458	Mainly from Netherlands Antilles.
Petroleum:			
Crude—thousand 42-gallon barrels	2,836	3,032	All from Venezuela.
Refinery products:			
Gasoline	954	13,450	Mainly from Netherlands Antilles.
Kerosine	83	3	All from United States.
Lubricants and greases	10,392	6,977	Mainly from United States.
Vaseline, paraffin and waxes	4,073	4,190	Do.
Other	300	552	Do.

Source: República del Ecuador. Anuario de Comercio Exterior, 1965.

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and lend it 1 million sucres, to be repaid over a period of 8 years. This is additional to the 3 million sucres loaned by the bank earlier in 1967. The national budget for 1967 included a 2 million sucre subsidy for the mine. The mine is kept in operation despite losses because of social and economic conditions in the area.

Iron and Steel.—Construction proceeded on the Guayaquil rolling mill of Sociedad Anónima Acerías Nacionales del Ecuador[3] (ANDEC). It is expected that the mill will come into production sometime during the first 4 months of 1969. Ownership of ANDEC is shared by the following: Compañia de Acero del Pacífico S.A. (CAP), a Chilean firm, 41 percent; the Atlantic Community Development Group for Latin America (ADELA), 30 percent, and unidentified Ecuadorian investors, 29 percent.

Planned annual mill capacity is 25,000 tons of bars with the raw material in the form of billets, furnished by CAP.

Rheem del Ecuador C.A. reportedly plans to produce steel drums primarily to supply containers to the Texaco lubricating oil and grease blending plant. Van Leer Tambores S.A. was granted industrial benefits by the Government for its planned facility to produce 5-, 16-, and 55-gallon drums for the local market. As Ecuador is not a producer of steel, both enterprises will presumably operate with imported materials.

Nonmetals.—*Sulfur.*—Cía. Azufrera Ecuatoriana, a subsidiary of Foreign Mining and Minerals, Inc., of Houston, Tex., announced discovery of high-grade volcanic sulfur deposits in Carchi Province near the Colombian border. Details of the operation were not available but no production was reported for 1967. Achievement of the planned output of 2,000 tons daily would exceed the handling capability of the Quito-San Lorenzo railroad; it was reported that plans were being formulated for the expansion of the rail facilities.

Canyon State Mining Corp. of Nevada acquired rights to explore, mine, mill, and export sulfur from Isla Isabela, the largest island in the Galapagos group. Current progress of the project is not known.

Fertilizantes Ecuatorianos S.A. (FERTISA), a Guayaquil firm, is reported to be developing the Tixán sulfur deposits in Chimborazo Province. Facilities are planned to produce sulfuric acid, phosphoric acid, and ammonium sulfate. The company is committed to establish an ammonia plant within 10 years.

Mineral Fuels.—*Petroleum.*—Texaco Inc. and Gulf Oil Corp. completed a wildcat discovery well in northeast Ecuador in early 1967. The two companies hold a concession area of 5.2 million acres; each company has a 50-percent share in the leases, with Texaco designated as the operator. Five successful wells have been completed in the general concession area, with total daily potential of 8,175 barrels of oil. Further drilling is planned.

The discovery is of considerable importance to Ecuador because reserves in the old fields of the Santa Elena peninsula are limited. In fact, the five wildcat wells have a higher rated daily capacity than all the present producing wells in Ecuador.

A considerable land play has developed in Ecuador in the wake of the new discoveries. It was reported in mid-1967 that 39 applications for leases had been filed with the Ministry of Industry and Commerce.

There is some question as to how soon the newly discovered oil will get to market. The Texaco-Gulf combine wished to establish a pipeline link with its comparatively nearby Colombian crude oil transportation network to the Pacific, which is nearing completion.[4] However, the Ecuadorian authorities have rejected this plan and insist that Ecuadorian oil be transported over Ecuadorian territory.

Petróleos Gulf del Ecuador was granted permission by the Ecuadorian Government to purchase the refinery on the Santa Elena peninsula owned by Cautivo Empresa Petrolera Ecuatoriana.

The Ecuador Government has proposed establishment of the Corporacíon Estatal Petrolera Ecuatoriana (CEPE). This Ecuadorian State Petroleum Corp. would be an autonomous entity, with legal personality, and would carry on all phases of the oil business on behalf of the State.

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[3] Compañía de Acero del Pacífico S. A. Twenty-second Annual Report, 1966–67, p. 14.
[4] International Financial News Survey. International Monetary Fund. V. 20, No. 10, Mar. 15, 1968, p. 88.

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FRENCH GUIANA

Little new information concerning mineral activity in French Guiana has become available. The Bureau de Recherches Géologiques et Minières continued its work on ground water studies and the geologic mapping program.

Construction continued at the National Center for Space Studies at Kourou which accelerated domestic output of some construction materials.

PRODUCTION AND TRADE

Statistics on mineral commodity production and trade are available only through 1966, and the paucity of production information for prior years makes it impossible to assess output trends.

Trade in mineral commodities remained small. Exports were limited to a small quantity of columbite-tantalite concentrates to the United States and reexports of nonferrous scrap and semimanufactures of iron and steel.

France supplied 70 percent of all imports by value in 1966, followed by the United States with 12 percent. However, the United States was the destination for 71 percent of exports by value, followed by France with 18 percent.

The following table shows the relationship between mineral commodity trade and total commodity trade:

	Value (thousand dollars)[1]		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	17	2,899	0.6
1966	9	3,451	0.3
Imports:			
1965	1,755	20,053	8.8
1966	3,105	27,802	11.2
Trade balance:			
1965	−1,738	−17,154	XX
1966	−3,096	−24,351	XX

XX Not applicable.
[1] Source has converted francs to dollars at the rate of 1,000 francs = US$202.55.

Table 4.—French Guiana: Production and exports of mineral commodities

Commodity		1963	1964	1965	1966
Metals:					
Columbite-tantalite:					
Production	kilograms	2,282	1,000	850	r 1,000
Exports	do.	2,282	[1] 1,923	[1] 406	[1] 274
Gold:					
Production:					
Native gold	troy ounces	6,993	NA	NA	630
Gold content	do.	NA	4,823	NA	NA
Exports:					
Native gold	do.	3,601	NA	-------	630
Gold content	do.	2,636	NA	-------	NA
Apparent average fineness		732	NA	-------	NA
Nonmetals, production:					
Clay	metric tons	NA	NA	NA	3,500
Sand	cubic meters	NA	NA	NA	100,000
Stone	do.	NA	26,000	NA	52,250

r Revised. NA Not available.
[1] U.S. imports.

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Table 5.—French Guiana: Imports of selected mineral commodities

(Metric tons)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum, all forms	39	222	France 178.
Copper, all forms	6	9	All from France.
Iron and steel:			
Bars and shapes	1,258	2,361	France 2,269.
Pipe and fittings	299	2,537	Mainly from France.
Plate and sheet	422	493	France 427.
Castings	41	64	All from France.
Lead, all forms	6	9	Do.
Zinc, all forms	4	4	Do.
Nonmetals:			
Cement, lime and other building materials	11,391	15,859	France 10,715; Venezuela 4,862.
Fertilizer materials: Manufactured	85	23	Mainly from France.
Sand, gravel and stone	14	11	All from France.
Other raw or unfinished mineral products	351	2,186	Trinidad and Tobago 1,939; France 247.
Mineral fuels:			
Gas, natural and manufactured	337	453	Trinidad and Tobago 314.
Tars, mineral, and raw chemical derivatives	20	12	Mainly from France.
Petroleum products	13,290	13,770	Trinidad and Tobago 12,788.
Other	10	9	All from France.

Source: European Economic Community, Statistical Office. Overseas Associates, Foreign Trade Statistics, No. 4, 1966; No. 3, 1967.

COMMODITY REVIEW

Mineral Fuels.—*Petroleum.*—Marine seismic work done in 1965 was studied and interpreted during the early part of 1966. No further field activity was conducted. Gulf States Land and Industries of New York ceased to be a participant with the French combine in the offshore oil prospecting program. Shell Petroleum Corp. took the place of Gulf States in the partnership.

PARAGUAY

Generally the output of mineral commodities in Paraguay in 1967 was at or slightly above the 1966 levels. A specific and significant exception was the production of cement and the cement raw materials limestone, and gypsum. The country's first oil refinery, which began operations in 1966, continued to produce throughout 1967; however, production was at a level considerably lower than its rated capacity.

Exports of minerals are deterred by the country's problems of moving bulk commodities over its main trade artery, the Paraguay River. River transport is seasonally limited by lack of water and there is no easy solution to the problem.

PRODUCTION

The only production of primary mineral commodities listed by official Paraguayan sources is of portland cement and lime. Formal statistics in respect to other building materials are not compiled. However, local industry sources do make available estimates of output for construction materials. Figures for 1966 and 1967 reflect the general slowing of the construction industry for the period. Major construction in progress was largely limited to building in connection with the Acaray Dam, and some road surfacing projects.

Paraguay became a producer of refined petroleum products for the first time in 1966.

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Table 6.—Paraguay: Production of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity		1963	1964	1965	1966	1967
Nonmetals:						
Cement		17,600	22,500	28,800	25,739	14,423
Clays:[1]						
Kaolin		NA	55	57	60	140
Other		NA	300,000	320,000	360,000	380,000
Gypsum		NA	780	2,200	2,500	1,800
Lime		17,400	17,800	18,500	17,610	17,600
Limestone:						
For cement [1]		33,600	40,500	40,000	38,000	22,000
For lime [1]		19,000	26,700	30,000	29,000	28,500
Marble		-------	-------	-------	-------	40
Ocher [1]		NA	55	60	10	22
Sand, for construction [1]		NA	185,000	230,000	300,000	340,000
Stone:						
Crushed rock		NA	730,000	510,000	700,000	730,000
Rough stone		NA	450,000	490,000	510,000	550,000
Building stone, semidressed		NA	35,000	37,000	35,000	37,000
Flagstone		NA	15,000	17,000	14,000	15,000
Paving blocks		NA	150	200	450	1,200
Talc		NA	47	140	60	72
Mineral fuels:						
Petroleum refinery products:						
Gasoline	42-gallon barrels	-------	-------	-------	124,420	332,857
Jet fuel	do	-------	-------	-------	6,458	55,294
Kerosine	do	-------	-------	-------	42,279	121,834
Diesel and gas oil	do	-------	-------	-------	130,190	403,227
Residual fuel oil	do	-------	-------	-------	74,120	195,569
Liquefied petroleum gas	do	-------	-------	-------	5,096	14,572

NA Not available.
[1] Based on industry or Government estimates.

Source: U.S. Embassy, Asunción.

TRADE

The relationship of trade in mineral commodities to total trade in all commodities is shown in the following tabulation:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	351	57,200	0.6
1966	6	49,000	(1)
Imports:			
1965	9,274	r 47,400	r 19.6
1966	11,207	49,500	22.6
Trade balance:			
1965	−8,923	r +9,800	XX
1966	−11,201	−500	XX

r Revised. XX Not applicable.
[1] Less than ½ unit.

Source: Banco Central del Paraguay, Departamento de Estudios Económicos Boletin Estadístico Mensual, Asunción, Paraguay, No. 115, December 1967. 81 pp.

Official statistics record mineral and metal exports of 1,050 tons of stone and 80 tons of scrap, all to Argentina. The rise in mineral and metal imports was largely in the categories of iron, steel, and cement. Steel imports were valued at over $3,500,000, a rise of slightly more than $400,000 over the import value for 1965.

The appreciable decrease in imports of petroleum products reflected the beginning of domestic refining. However, Paraguay is now enrolled in the ranks of crude oil importers.

In terms of value, Argentina and the United States were the two primary destinations for total Paraguayan exports. Argentina received 32 percent of total shipments followed by the United States with 23 percent. European countries took most of the remaining shipments. Argentina supplied about 20 percent of Paraguayan imports by value, closely followed by the United States and West Germany. The three countries supplied about 60 percent of total imports.

In late 1966 the U.S. Department of Commerce published an updated report on "Foreign Trade Regulations of Paraguay." [5]

[5] U.S. Department of Commerce. Foreign Trade Regulations of Paraguay. Overseas Business Reports, OBR–66–95, rev. by Hilda Basora, 1966, 7 pp.

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Table 7.—Paraguay: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966 [1]
Metals:			
Aluminum, all forms	13	39	Belgium 22; Uruguay 7; Argentina 5.
Copper, wire	146	199	Germany 155; Belgium 21.
Iron and steel, all forms	13,620	18,209	Argentina 5,262; United States 2,253; Germany 2,221; Italy 2,143.
Lead, all forms, including solder	96	56	United Kingdom 20; Germany 17; United States 13.
Tin, all forms, long tons	15	20	United Kingdom 11; United States 8.
Nonmetals:			
Cement, portland	776	7,575	Uruguay 7,041; Argentina 239.
Gypsum	198	NA	
Salt	21,617	20,495	All from Argentina.
Stone clay, earth and manufactures thereof.	2,284	2,876	Argentina 1,240; Uruguay 406; Brazil 204.
Mineral fuels:			
Coal	60	63	Germany 25; Belgium 25.
Petroleum:			
Crude	------	41,633	All from North Africa.
Refinery products:			
Gasoline	41,620	31,934	Mainly from Netherlands Antilles.
Kerosine	24,148	14,719	Do.
Distillate fuel oil	18,260	19,365	NA.
Residual fuel oil	89,902	54,794	Argentina 32,489; Netherlands Antilles 16,229.
Lubricants	4,131	5,223	Netherlands Antilles 2,491; United States 2,022.
Asphalt	2,505	6,269	Mainly from Argentina.

NA Not available.
[1] Source does not differentiate between East and West Germany.

Source: Banco Central del Paraguay. Departamento de Estudios Económicos. Boletin Estadístico Mensual. Asunción, Paraguay, No. 115, December 1967, 81 pp.

COMMODITY REVIEW

Nonmetals.—*Cement.*—The Krupp firm of West Germany was awarded a contract to build a new cement plant at Vallemí in the northern part of Paraguay. The contract was signed on May 11, 1967, subject to approval by Paraguayan Congress. The plant is to be completed 24 months after Congressional ratification.

Planned capacity of the plant is 100,000 tons per year. Basic cost is estimated at around $6 million, but because Krupp is to finance the cost of the plant at an interest rate of 7.5 percent, total cost will be somewhat higher.

Mineral Fuels.—*Petroleum.*—Paraguay's only refinery went on stream August 11, 1966. Refineria Paraguay SA (REPSA) is reportedly owned by U.S. interests. The refinery capacity is rated at 10,000 barrels per day input, although the present market for products in the country is about 3,500 barrels per day. Trade journals report that a French state-owned organization has a contract to supply 3,000 barrels per day of crude oil over a 3 year term. The crude will presumably come from the Algerian Hassi Messaoud field.

Feedstock is shipped to Buenos Aires, Argentina where REPSA has a 200,000-barrel tank farm. Crude oil is then barged up the Paraguay River; in case of drought which might hinder normal river shipments, an intermediate tank farm has been established 90 miles south of the refinery. If necessary, smaller vessels can be used to navigate a lower-than-normal river. There is also storage for 250,000 barrels of crude oil and products at the refinery.

The plant produces liquified petroleum (LP) gas, gasoline, kerosine diesel oil, gas oil, fuel oil, and jet fuel. The jet fuel will be exported.

Placid Oil Co., a U.S. firm, withdrew from its Paraguayan petroleum concession in the northwest Chaco area early in 1967. Following this event, the Government of Paraguay considered forming Yacimientos Petrolíferos Paraguayas (YPP) to encourage the search for oil in Paraguay. There was also some suggestion that REPSA and YPP might undertake a joint venture to explore the lease area formerly held by Placid.

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URUGUAY

Uruguay's general economic situation continued weak although the Government took measures to halt the downward trend. Agricultural output, the backbone of the country's economy, decreased substantially because of very bad weather conditions. The cost-of-living index continued to rise sharply in 1967.

In what was called an unavoidable initial measure to help improve exports and foreign exchange reserves, the peso was devalued to 200 for U.S.$1.

In sympathy with the inflationary trend, the price on regular gasoline was raised from 11.5 pesos to 20 pesos per liter, up 73.9 percent; premium gasoline was raised from 12.5 pesos to 23 pesos per liter, an increase of 84 percent.

Little new information was reported concerning mineral commodity developments except that studies were conducted that might lead to the opening of an iron ore mine, and unsubstantiated rumors of gold finds.

PRODUCTION AND TRADE

Although 1967 production data were not available in time for inclusion in this report, construction materials and petroleum refinery products presumably continued to be Uruguay's only significant mineral industry products, while output of iron ore, steel, secondary aluminum, aluminum, semimanufactures, and several nonconstruction industrial minerals continued on a small scale.

Imports of crude oil rose moderately and 1966 became the first year that the only refinery combustible to be imported by the Administracion Nacional de Combustibles, Alcohol y Portland (ANCAP) was 115,000 barrels of fuel oil. Demand for other combustible products was satisfied by ANCAP. The table of imports indicates moderate receipts of lubricants and special purpose commodities.

ANCAP reported imports of 11.5 million barrels of crude oil in 1966 of which 53.3 percent came from the Persian Gulf area, 29.9 percent from Venezuela, and the remainder from Nigeria, Algeria, and the U.S.S.R.

In terms of 1966 total trade, by value, 13.9 percent of exports were destined for the United Kingdom, 12.4 percent for the United States, and 9.2 percent for the Netherlands; Brazil supplied 13.5 percent of all imports, followed by the United States with 11.9 percent and West Germany with 11.3

The following table shows the value of commodity trade in relation to total trade for 1965 and 1966:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	1,037	191,165	0.5
1966	2,670	186,000	1.4
Imports:			
1965	35,100	150,654	23.3
1966	41,909	164,000	25.6
Trade balance:			
1965	−34,063	+40,501	XX
1966	−39,239	+22,000	XX

XX Not applicable.

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Table 8.—Uruguay: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Aluminum:					
Secondary metal	NA	150	150	305	250
Semimanufactures	NA	1,500	1,035	1,126	1,750
Iron and steel:					
Iron ore	1,031	1,667	e 1,700	NA	-------
Crude steel [1]	6,500	14,327	13,476	e 23,000	NA
Ferrosilicon	NA	e 800	1,500	e 1,000	NA
Rolled products	[1] 21,970	e 39,000	[1] 36,300	36,000	37,300
Nonmetals:					
Alum schist	79	35	114	288	293
Cement	339,727	412,164	431,433	478,143	420,604
Clays:					
Refractory	3,217	484	4,679	8,270	79,358
Other [2]	NA	36,000	48,418	54,732	NA
Dolomite	26,806	26,937	20,413	28,940	14,919
Feldspar	287	897	1,247	1,750	1,262
Gem stones, exports [3]	92	103	54	58	60
Lime e	30,000	42,000	60,000	60,000	e 70,000
Limestone	NA	750,394	746,509	770,669	726,637
Quartz	1,681	1,256	292	525	349
Sand and gravel:					
Common sand	470,667	441,906	657,056	745,372	722,186
Quarry sand	32,401	35,234	34,463	17,938	27,662
Gravel	32,624	47,447	113,776	72,813	106,989
Stone:					
Granite, exports	896	1,236	2,301	2,330	2,938
Marble	2,043	1,140	2,710	2,824	2,789
Paving blocks	1,173	1,068	2,153	1,774	1,809
Rough stone	39,738	61,087	46,869	23,938	34,248
Ballast	321,877	344,857	214,495	196,630	259,367
Sulfur [4]	-------	-------	-------	-------	50
Talc	1,715	2,124	2,375	2,128	2,638
Mineral fuels:					
Coke, gashouse	21,160	20,850	19,563	20,979	21,282
Gas, manufactured ---million cubic feet	1,059	1,059	NA	NA	970
Petroleum refinery products:					
Gasoline ---thousand 42-gallon barrels	2,328	2,385	r 2,306	r 2,322	2,343
Jet fuel ---do	88	107	r 105	r 133	169
Kerosine ---do	1,434	1,509	r 1,285	r 1,300	1,271
Distillate fuel oil ---do	1,998	2,330	r 2,220	r 2,262	2,270
Residual fuel oil ---do	4,130	4,367	r 4,974	r 4,785	4,792
Liquefied petroleum gas (LPG) ---do	53	183	r 203	r 239	236
Asphalt ---do	81	61	r 113	r 112	69
Other ---do	108	63	r 29	r 31	276

e Estimate. r Revised. NA Not available.

[1] As reported by Revista Latinoamericana de Siderurgia (ILAFA), No. 76, August 1966.

[2] Variously reported as common clay or clay for cement; data probably do not represent total production of either category.

[3] Mostly agate, but probably includes some amethyst.

[4] Recovered from refinery gases.

Table 9.—Uruguay: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals: Iron pipe and fittings	1,852	-------	
Nonmetals:			
Cement	36,747	51,872	Brazil 46,871; Argentina 4,580.
Dolomite	4,800	15,071	Argentina 14,820; Brazil 251.
Gem stones: Rough [1]	54	69	West Germany 29; Japan 23; Italy 10.
Sand, gravel, broken stone:			
Sand	-------	517,930	All to Argentina.
Stone, broken	151	-------	
Stone, dimension:			
Granite	2,301	2,228	Italy 456; Japan 452; West Germany 377.
Marble	204	119	Argentina 73; Mexico 36.
Talc, ground	10	-------	
Mineral fuels: Liquified petroleum gas (LPG).	503	-------	

[1] Variety unspecified.

Source: Banco de la República Oriental del Uruguay, Departamento de Investigaciones Económicas. Exportaciones Cumplidas 1965 and 1966, Cuadro 10.

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Table 10.—Uruguay: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity		1965	1966
Metals:			
Aluminum:			
Bauxite		500	1,005
Alumina		941	396
Metal, wrought and unwrought		420	1,496
Antimony, all forms		4	11
Arsenic, white		78	61
Copper, wrought and unwrought		198	628
Gold bullion	troy ounces	3,240	NA
Iron and steel:			
Oxides		136	17
Scrap		20	52
Powder		25	10
Ferroalloys		243	156
Pig iron and ingot steel		15,010	34,872
Semimanufactures		38,707	47,622
Lead:			
Oxide		129	231
Metal, all forms		943	821
Manganese oxides		27	17
Mercury	76-pound flasks	2	23
Nickel		8	4
Platinum and palladium	troy ounces	192	NA
Silver bullion	do	2,413	868
Tin:			
Unwrought	long tons	46	27
Babbitt metal		3	4
Zinc, wrought and unwrought		747	1,053
Other metals, not elsewhere specified		78	80
Nonmetals:			
Abrasives		62	81
Alums		15	11
Asbestos		1,297	1,381
Barite		57	33
Cement		50	47
Clays:			
Bentonite		6	42
Kaolin		1,208	1,614
Other		133	143
Cryolite		2	2
Diatomaceous earth		------	305
Feldspar		6	1
Fertilizer materials:			
Nitrogenous		5,414	8,484
Phosphatic		43,979	89,726
Fluorite		50	185
Graphite		2	3
Gypsum		12,682	19,433
Infusorial earths		257	305
Mica and micanite		302	2
Potassium hydroxide		50	167
Refractory bricks and similar products		337	243
Salt		5,725	7,650
Sodium carbonate		7,704	11,656
Sodium hydroxide		2,723	2,929
Sulfur		8,580	9,420
Talc		12	------
Mineral fuels:			
Asphalt		73	34
Carbon black		663	1,530
Coal		32,955	14,235
Coke		1,933	1,952
Petroleum:			
Crude	thousand 42-gallon barrels	11,151	11,707
Refinery products:			
Gasoline	do	144	------
Kerosine	do	103	------
Distillate fuel oil	do	166	------
Residual fuel oil	do	1,152	------
Lubricants	do	101	170
Other	do	8	77

NA Not available.

Source: Banco de la República Oriental del Uruguay, Departamento de Investigaciones Económicas. Importaciones Cumplidas 1965 and 1966, Cuadro 27.

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COMMODITY REVIEW

Nonmetals.—*Cement.*—Consumption of cement in Uruguay rose from 323,000 tons in 1963 to 390,000 tons in 1966.

ANCAP received a loan of $6 million from the Inter-American Development Bank to help finance a cement plant now under construction at Paysandu. Total cost of the plant is estimated at $14.9 million. Rail lines to market as well as to raw materials will be improved or newly installed. Rolling stock will also be obtained.

It is expected that the plant will be producing 120,000 tons of cement annually by 1971.

Sulfur.—A desulfurization plant was installed at the ANCAP refinery by The Kellogg Company; the plant, which treats the refinery gases, was completed in May 1965. In 1966, 50 tons of sulfur was recovered.

Mineral Fuels.—*Petroleum.*—Refinery throughput for 1965 and 1966 was steady at close to 11.5 million barrels. Runs for 1966 amounted to just over 11.5 million barrels compared with slightly less than that figure during the preceding year.

Refinery improvements made by ANCAP include a desulfurization plant, expansion for capacity to produce asphalt and a blending plant for bulk lubricants.

Consumption of petroleum products in Uruguay in 1966 was about 9.9 million barrels. Of this amount, 3.9 million barrels was residual fuel oil and 2.3 million barrels was gasoline.

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The Mineral Industry of Other European Countries

By Columbus R. Gentile [1] F. L. Klinger [2] and Bernadette Michalski [3]

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ALBANIA

Albanian mineral production in 1967 included bitumen, cement, chromite, copper, iron-nickel ore, lignite, and petroleum. While no actual production figures are available, the overall industrial growth rate for 1967 was reported at 12.8 percent. As mineral production accounts for about one-fifth of the industrial output, at least part of the growth is attributable to the reported aboveplan production of chromite, copper, iron-nickel ore, and petroleum.

[1] Mineral specialist, Division of International Activities.
[2] Physical scientist, Division of International Activities.
[3] Commodity research specialist, Division of International Activities.

Table 1.—Albania: Production of selected mineral commodities

(Metric tons unless otherwise specified)

	1963	1964	1965	e 1966	e 1967
Metals:					
Chromite	r 293,300	r 306,600	310,800	315,000	NA
Copper:					
Ore, gross weight	r 147,919	r 148,775	225,639	r 250,000	NA
Blister	2,040	2,204	4,160	4,200	NA
Iron-nickel ore	r 255,014	r 351,744	395,712	r 410,000	NA
Nonmetals: Cement	129,596	126,900	134,100	135,000	130,000
Mineral fuels:					
Coal (lignite)—thousand tons	252	292	331	r 340	340
Petroleum:					
Crude—do	r 746	r 767	850	r 875	1,090
Refinery products:					
Gasoline—do	r 56	53	45	NA	NA
Gas oil—do	92	80	78	NA	NA
Diesel oil—do	2	2	2	NA	NA
Other—do	r 321	r 336	378	NA	NA
Total—do	r 471	r 471	503	500	520
Electric power—thousand kilowatt hours	258	r 280	342	NA	NA

e Estimate. r Revised.

Source: Vietari Statistikor I.R.P.Sh. 1966 (Statistical Yearbook of the Peoples Republic of Albania for 1966). Tirana, Albania, 160 pp.

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TRADE

Although trade statistics for 1966–67 are not available, there have been no indications of significant changes in Albania's established trade pattern. Most of Albania's mineral output is exported with the exception of petroleum, much of which is consumed domestically. Mineral products for the bulk of Albanian exports while steel, machinery, and spare parts constitute most of the imports.

Other Communist nations continued to be Albania's major trading partners; mainland China was the destination of the bulk of chromite, copper, and petroleum exports, and the principal source of steel ingots and semimanufactures.

Albania's very limited trade with non-Communist countries, in 1965, included imports of 80 tons of aluminum foil from West Germany, 2,000 tons of iron and steel plates and sheets from the United Kingdom and Italy, 5,000 tons of nitrogenous fertilizer from Belgium-Luxembourg and Italy, and 1,000 tons of lubricants from Austria. Albanian exports included 175 tons of copper, 3,000 tons of iron and steel, and 60,000 tons of petroleum crude to Italy. A small quantity of Albanian chromite, 4,000 tons, containing 40 to 46 percent metal, entered the U.S. market in 1967. While a very limited trade has developed between Albania and a few Western nations, economic ties and trade agreements with Asian and European Communist nations preclude expanded trade activity with the West.

Table 2.—Albania: Trade of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1964	1965
Exports:		
Metals:		
Chromite	310,700	297,000
Copper, blister	2,337	3,683
Iron-nickel ore	461,900	505,000
Nonmetals:		
Bitumen (natural asphalt)	10,200	11,000
Mineral fuels:		
Petroleum:		
Crude—thousand tons	294	284
Refinery products—do	242	268
Imports:		
Metals:		
Iron and steel:		
Pig iron	2,684	1,835
Steel, ingots	6,895	5,390
Semimanufactures:		
Pipe	10,849	11,608
Other	26,062	26,643
Total	36,911	38,251
Zinc oxide	-------	172
Nonmetals:		
Cement	39,500	53,000
Fertilizers, manufactured	17,400	18,000
Sulfuric acid	1,584	1,800
Mineral fuels: Coke	10,392	17,482

Source: Vietari Statistikor I.R.P.Sh. 1966 (Statistical Yearbook of the Peoples Republic of Albania for 1966). Tirana, Albania, 160 pp.

COMMODITY REVIEW

Metals.—*Chromite.*—Above-plan production of chromite was reported during 1967 at the Balquize, Kami, and Badre mines.

Copper.—During 1967, the Kurbnesh mine and concentrator, the Kukes smelter, and the Spac, Gjegani, and Tuci mines were in full operation. Expansion of the Rubik refinery under Chinese assistance continued in 1967, with completion scheduled for early 1968.

Nonmetals.—*Cement.*—A second cement plant at Elbasan was near completion at yearend and was to be ready for clinker production by early 1968.

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Fertilizer Materials.—The Lac superphosphate plant was reported in full operation during 1967. The Fieri nitrogenous fertilizer plant with a reported annual capacity of 112,000 tons was completed during the year.

Mineral Fuels.—With the exception of coking coals imported from Poland, most of Albanian fuel requirements are satisfied by domestic output of petroleum and low grade coal. Through 1967, Albania was able to export both crude oil and refinery products, because crude oil output exceeded refinery capacity, and refinery output exceeded domestic requirements. Completion of the Rumanian built 450,000 ton-per-year Fieri refinery, scheduled for 1970, will give Albania sufficient refinery capacity to process its entire crude output, marking the end of crude oil exports, and increasing the refined products exports.

DENMARK (INCLUDING GREENLAND)

DENMARK

Commercial mineral resources of continental Denmark and adjacent islands were limited to nonmetallic construction materials, lignite, and bog iron ore. Domestic mineral output contributed less than 1 percent of the gross national product in 1967. The petroleum industry was the center of development activity during 1966–67. Exploratory drilling operations were conducted by Dansk Undergrunds Consortium, which is jointly owned by A. P. Moeller, Shell, Gulf, and Amoseas. Drilling operations conducted on the East Jutland Coast and on Falster Island were abandoned by yearend 1967 when no commercial oil or gas was uncovered. Two offshore exploration test rigs were in operation during the year, but were relocated after oil shows were insignificant. No crude petroleum is produced in Denmark; its significant refining industry is based entirely on imported raw material.

Denmark's third refinery, the 40,000-barrel-per-day Shell refinery at Fredericka, completed its first full year's operation in 1967, accounting for the Country's substantial increase in petroleum product output. A further significant increase is anticipated in 1968 when expansion programs are completed at Gulf's Stignaes Refinery, doubling the plant's capacity to 70,000 barrels per day.

Trade returns for 1966, the most recent year for which complete data are available, indicate a 10.7-percent growth in mineral commodity exports and a 0.4-percent decline in mineral commodity imports, as shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	82.1	2,273.3	3.6
1966	92.8	2,401.9	3.9
Imports:			
1965	660.6	2,811.3	23.5
1966	658.2	2,990.0	22.0
Trade balance:			
1965	−578.5	−538.0	XX
1966	−565.4	−588.1	XX

XX Not applicable.

Principal destinations and dollar value of shipments for 1966 mineral commodity exports were Sweden—$33.1 million; West Germany—$16.5 million; and Norway—$13.3 million. Principal sources and value of 1966 mineral commodity imports were West Germany—$113.7 million; United Kingdom—$89.3 million; Sweden—$52.9 million; and Norway—$48.2 million. In terms of country groups, Danish mineral commodity imports from European Economic Community nations declined from $258.9 million 1965 to $237.2 million in 1966, while imports from other countries of the European Free Trade Association (of which Denmark is a member) fell only $1.4 million to $200.3 million.

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Table 3.—Denmark: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Iron and steel:					
Iron ore (less than 42 percent iron) [1]	85,000	e 90,000	e 65,000	55,000	57,000
Pig iron	69,368	72,461	74,908	82,000	75,000
Iron castings, including malleable iron	132,661	134,547	146,119	145,000	150,000
Steel, ingots and castings	359,000	396,000	412,000	405,000	397,000
Rolled products:					
Heavy and medium plates	147,900	174,300	184,300	185,000	196,000
Light and heavy sections	119,500	137,200	140,500	152,900	179,000
Welded tubes [2]	28,923	35,443	35,199	NA	NA
Nonferrous metals, including alloys:					
Ingots and bars	30,350	24,125	32,676	35,000	NA
Semimanufactures	36,301	43,861	47,241	50,000	NA
Alloy castings	8,593	11,221	11,752	12,600	NA
Nonmetals:					
Asbestos-cement products	152,000	218,000	221,000	225,000	225,000
Cement:					
Portland—thousand tons	1,287	1,898	2,000	r 2,100	2,200
Other—do	234				
Chalk:					
Crude, for sale	14,396	e 14,000	NA	NA	NA
Washed or precipitated	32,121	e 35,000	e 35,000	32,000	35,000
Diatomaceous materials:					
Diatomite	20,000	18,500	12,500	r 10,000	20,000
Moler	192,000	191,200	212,700	203,200	200,000
Fertilizer:					
Superphosphate (16 to 18 percent) phosphorus pentoxide	17,309	43,205	43,496	50,000	50,000
Potash superphosphate	737,512	715,391	755,570	714,000	NA
Manganese sulfate [3]	1,333	1,369	943	1,500	1,500
Flint, pebble grade	2,545	r 5,000	e 3,500	3,500	5,000
Kaolin:					
Crude, for refractory products	12,062	8,000	6,847	15,000	15,000
Washed (including pressed)	6,600	NA	2,500	3,000	3,000
Lime:					
Quicklime	151,824	159,284	162,667	150,000	190,000
Agricultural	310,000	370,000	410,000	275,000	290,000
Salt				25,000	100,000
Stone, sand and gravel:					
Granite:					
Total quarry production	630,153	914,437	699,692	e 700,000	NA
Dimension stone, rough and finished	33,639	38,235	34,113	NA	NA
Other worked stone value, thousands	$203	$435	$386	NA	NA
Limestone and marl—thousand tons	3,150	NA	NA	3,500	NA
Gravel—thousand cubic meters	3,500	3,600	4,200	[4] 5,300	5,000
Mineral fuels:					
Coke—thousand tons	r 505	r 424	r 329	r 317	268
Lignite—do	2,512	2,195	2,128	r 1,982	e 1,900
Lignite briquets—do	61	66	r 24	50	27
Peat, for fuel—do	50	r 40	r 20	r 10	e 10
Petroleum refinery products:					
Gasoline—thousand 42-gallon barrels	3,531	4,993	5,719	6,529	9,453
Kerosine—do	359	430	646	916	966
Distillate fuel oil—do	3,157	5,405	6,899	8,501	13,250
Residual fuel oil—do	6,486	9,678	11,380	14,876	19,502
Liquefied petroleum gases—do	NA	951	1,083	1,280	1,582
Lubricants, including greases—do	15	7	NA	NA	NA
Bitumen—do	NA	157	160	280	399
Other—do	1,322	1,379	2,159	2,805	2,613
Total—do	14,870	23,000	28,046	35,187	47,765
Refinery fuel and loss—do	465	718	489	664	NA

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Quantities of merchantable iron ore, as given by United Nations and Organization for Economic Cooperation and Development (OECD) publications, are 20,000 to 29,000 tons less than the figures shown for 1964.

[2] Made from imported strip.

[3] Manganese obtained from domestic bog iron ore.

[4] Including sand.

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Table 4.—Denmark: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Oxide and hydroxide [1]	114	85	United Kingdom 50.
Unwrought, including scrap [2]	3,517	3,758	Sweden 2,038; West Germany 1,004.
Semimanufactures [2]	909	1,169	West Germany 218; Finland 157; Sweden 150.
Copper: [2]			
Scrap	4,530	3,548	West Germany 2,035; Belgium-Luxembourg 1,143.
Unwrought	475	766	Italy 564.
Semimanufactures	1,768	1,873	Portugal 500; Israel 339; Sweden 336.
Iron and steel:			
Iron ore	36,100	26,169	West Germany 10,103; United Kingdom 5,594.
Oxide	91	75	NA.
Roasted pyrite	95,003	88,183	West Germany 65,750; United Kingdom 22,433.
Slag, dross, scale, etc	1,319	7,400	Norway 3,955.
Scrap, pig iron, and ferroalloys [3]	42,780	39,873	West Germany 14,165; Norway 13,828.
Ingots and other primary forms	3,135	3,136	Norway 3,069.
Semimanufactures:			
Bars, rods, sections	28,546	31,820	West Germany 14,774; Sweden 9,240.
Plates and sheets	102,265	105,462	Sweden 51,716; Norway 25,319.
Tubular products	9,004	9,115	Sweden 3,921; Poland 1,635.
Castings and forgings	4,726	4,692	Sweden 2,073; West Germany 554.
Other	637	546	Sweden 139; Norway 130; United States 55.
Total semimanufactures	145,178	151,635	
Lead: [2]			
Unwrought, including scrap	4,716	5,735	Norway 2,327; United States 838; Switzerland 831.
Semimanufactures	276	146	Norway 104.
Magnesium, including scrap	78	53	All to the United States.
Manganese oxide	55	110	All to the United Arab Republic.
Nickel, scrap and semimanufactures [2]	179	428	France 100; Netherlands 91; United Kingdom 78.
Silver and platinum group metals:			
Silver, value, thousands, including semimanufacturers.	$70	$81	Sweden $45; Norway $12.
Waste and scrap do	$1,088	$1,275	United Kingdom $478; West Germany $432; Switzerland $189.
Tin:			
Unwrought [2], long tons, including scrap.	662	824	Hungary 250; Venezuela 147; Norway 144.
Semimanufactures do	38	27	Sweden 22.
Titanium dioxide	58	48	NA.
Zinc:			
Oxide	33	-------	
Scrap, including dust (blue powder).	1,807	2,096	West Germany 673; France 315; Spain 249.
Unwrought and semimanufactures.[2]	681	402	Sweden 84; Norway 69.
Other:			
Metallic oxides, n.e.s	4	15	NA.
Metalliferous ores, ashes and residues, n.e.s.	-------	5,010	Belgium-Luxembourg 2,067.
Base metals, including semimanufactures, n.e.s.	14	60	NA.
Nonmetals:			
Asbestos:			
Crude fiber and manufactures (nonfriction).	162	-------	
Asbestos and fiber-cement articles	7,567	6,883	Norway 5,326; West Germany 1,047.
Cement	94,648	202,830	United Kingdom 83,317; Sweden 16,848.
Chalk	23,936	23,347	West Germany 9,190; Sweden 7,539.
Clay:			
Kaolin	48	3,653	Finland 2,094; Sweden 1,062.
Refractory and other	5,548		
Construction materials (brick, tile, etc.):			
Refractory [4]	51,751	50,375	West Germany 12,701; United Kingdom 10,333.
Nonrefractory	150,548	142,067	West Germany 88,352; Norway 28,658.
Cryolite and chiolite, natural	26,145	e 26,500	NA.

See footnotes at end of table.

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Table 4.—Denmark: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals—Continued			
Diamond and other precious and semiprecious stones:			
Diamond, value, thousands—nonindustrial, unset.	$127	$27	Sweden $17.
Other—kilograms	50	NA	
Diatomite and other siliceous earths	112,888	102,399	West Germany 55,000; United Kingdom 36,000.
Fertilizer (manufactured), all types	6,343	62,747	U.S.S.R. 61,948.
Flint	42,390	NA	NA.
Lime	20,226	20,051	Sweden 9,413; Norway 9,340.
Limestone (for cement, flux, etc.)	65,895	77,722	Sweden 37,311; West Germany 30,476.
Quartz and quartzite	858	14,480	Mainly to West Germany.
Salt	347	13,435	Sweden 7,644; Norway 4,631.
Stone, sand, and gravel:			
Dimension stone:			
Unworked, all types	109,624	79,111	West Germany 78,991.
Worked, all types	1,988	2,125	Norway 1,020; Sweden 697.
Gravel and crushed stone, thousand tons	1,899	2,128	West Germany 2,099.
Sand	166,097	137,891	Sweden 87,959; West Germany 35,648.
Sulfuric acid	12,120	2,328	United Kingdom 2,226.
Mineral substances, n.e.s	2,503	1,564	West Germany 1,343.
Slag and ash, n.e.s	98,132	81,778	West Germany 81,772.
Mineral fuels:			
Asphalt, natural, including manufactures.	1,013	1,576	Finland 1,194.
Carbon black	75	87	Sweden 32; Norway 28.
Coal derivatives	2,887	10,546	Netherlands 6,772; France 1,958.
Coke	51,046	50,695	Norway 26,175; Sweden 18,225.
Lignite, including briquets	9,800	-------	
Peat, including briquets and litter	5,221	6,823	West Germany 4,909; Switzerland 892.
Petroleum refinery products:			
Gasoline	264,137	326,220	Sweden 253,035; United Kingdom 52,986.
Kerosine, including white spirit	4,660	24,561	Norway 24,530.
Distillate fuel oil	213,624	337,888	Sweden 332,303.
Residual fuel oil	196,169	33,288	United Kingdom 17,669; Sweden 15,619.
Lubricants, including grease	12,822	18,366	Norway 12,498; Sweden 3,795.
Liquefied petroleum gases	2,972	10,465	United Kingdom 4,962; Sweden 2,716; Norway 2,222.
Bitumen and other	2,050	3,375	Sweden 1,667; Norway 783.
International bunkers:			
Distillate fuel oil	168,000	186,000	
Residual fuel oil	333,000	444,000	

e Estimate.
r Revised. NA Not available.
1 Including synthetic corundum.
2 Including alloys.
3 Including spiegeleisen and grit, sponge, or powder of iron or steel.
4 Including those of magnesite, diatomite, and other refractory materials.

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Table 5.—Denmark: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite, oxide and hydroxide [1]	3,246	1,836	Guyana 1,384.
Scrap [2]	1,273	1,091	Norway 428; Sweden 334.
Unwrought [2]	9,310	6,281	Norway 3,406; United Kingdom 1,039.
Semimanufactures [2]	14,209	14,699	West Germany 2,620; Sweden 2,015; Switzerland 1,804.
Antimony, all forms	103	NA	
Beryllium—kilograms	1,000	-------	
Chromium oxide and hydroxide	289	380	West Germany 142; France 110.
Cobalt oxide and hydroxide	22	3	NA.
Copper: [2]			
Unwrought, including scrap	4,079	4,400	Belgium-Luxembourg 2,492; West Germany 1,015.
Semimanufactures	29,530	21,183	Sweden 8,602; Belgium-Luxembourg 4,524.
Cuprous oxide	200	NA	
Iron and steel:			
Iron ore	2,975	1,932	Sweden 1,102.
Roasted pyrite and pyrrhotite	5,103	10,261	Norway 8,156; Sweden 2,105.
Slag, dross, scale, etc	21,174	26,655	United Kingdom 24,283.
Scrap	275	592	West Germany 269; Sweden 139.
Pig iron and cast iron [3]	109,882	95,673	U.S.S.R. 29,324; East Germany 22,932; West Germany 14,980; Finland 10,344.
Ferroalloys	6,692	9,165	Norway 6,741; U.S.S.R. 1,563.
Ingots and other primary forms	66,869	49,732	Norway 33,070; West Germany 7,600.
Semimanufactures:			
Bars, rods, sections [4]	385,343	332,489	West Germany 117,522; Belgium-Luxembourg 65,840.
Plates and sheets	477,994	445,351	West Germany 122,236; Sweden 75,862.
Hoop and strip	73,589	64,236	Belgium-Luxembourg 31,063; West Germany 14,336.
Rails and accessories	22,679	18,191	Sweden 13,649.
Wire	14,799	10,102	Belgium-Luxembourg 3,926; West Germany 2,849.
Tubular products	139,971	119,468	West Germany 47,064; United Kingdom 15,395.
Castings	74	151	Italy 48; Belgium-Luxembourg 36; Norway 17.
Total semimanufactures	1,114,449	989,988	
Iron oxide and hydroxide	3,441	3,197	West Germany 2,665.
Lead:			
Oxides	1,255	1,249	West Germany 435; France 277.
Scrap	5,498	5,797	Norway 2,963; Kenya 600.
Unwrought [2]	14,500	14,350	Sweden 5,503; Republic of South Africa, 2,083.
Semimanufactures [2]	731	534	Belgium-Luxembourg 217; West Germany 216.
Magnesium, all forms	152	88	Norway 52; West Germany 11.
Manganese:			
Ore	6,360	8,183	India 3,555; mainland China 2,555.
Oxides	1,123	1,724	Japan 920; West Germany 300.
Mercury—76-pound flasks	609	609	Italy 261; Sweden 146.
Molybdenum, all forms—kilograms	3,000	1,000	All from Austria.
Nickel:			
Ore and matte	17	41	United Kingdom 25.
Unwrought, including scrap [2]	126	85	United Kingdom 76.
Semimanufactures [2]	695	805	United Kingdom 218; West Germany 203; Finland 102.
Silver and platinum group metals:			
Silver:			
Unwrought—value, thousands	$5,148	$4,797	United Kingdom $2,478; West Germany $1,211.
Semimanufactures—do	$129	$108	United Kingdom $74.
Platinum and platinum group metals—troy ounces	6,398	NA	
Waste and scrap—kilograms	2,700	NA	
Tantalum, all forms—value, thousands	$5	NA	
Tin:			
Scrap—long tons	70	93	Norway 43; Belgium-Luxembourg 18; Singapore 13.
Unwrought [2]—do	r 950	1,042	Mainland China 422; West Germany 195.
Semimanufactures [2]—do	98	95	United Kingdom 59; West Germany 32.
Titanium dioxide	5,793	5,949	Norway 1,439; West Germany 1,318; United Kingdom 1,288.

See footnotes at end of table.

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Table 5.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Tungsten ---- kilograms	4,000	7,000	Sweden 6,000.
Zinc:			
Oxides	1,392	1,556	West Germany 510; United States 320.
Dust (blue powder) and scrap	385	458	Norway 168; Sweden 74.
Unwrought [2]	11,704	9,869	Norway 3,270; Belgium-Luxembourg 2,312; Netherlands 1,998.
Semimanufactures [2]	6,558	6,256	Poland 1,866; Belgium-Luxembourg 1,859; West Germany 828.
Other:			
Metalliferous ores, ashes, residues, n.e.s.	1,221	2,467	Australia 733.
Base metals, including semimanufactures, n.e.s.	216	206	Mainland China 146; Belgium-Luxembourg 26.
Pyrophoric alloys	5	5	Austria 2; United States 2.
Nonmetals:			
Asbestos:			
Crude	26,589	20,768	Canada 8,773; Republic of South Africa, 5,415; Cyprus 4,775.
Asbestos and fiber-cement articles	13,153	2,269	Czechoslovakia 1,217; Belgium-Luxembourg 561.
Barite	622	1,140	West Germany 644; Italy 400.
Borates, natural	1,375	1,313	United States 886; Turkey 400.
Boric acid	132	103	NA.
Cement	38,963	2,327	West Germany 1,232; United Kingdom 757.
Chalk	1,217	633	United Kingdom 247; West Germany 153.
Clay:			
Kaolin	31,293		
Other refractory	29,842	72,228	United Kingdom 48,782; Czechoslovakia 11,334.
Bleaching	455		
Other	8,523		
Construction materials (brick, tile, etc.):			
Refractory	25,050	27,777	West Germany 7,889; Sweden 7,548; Austria 6,028.
Nonrefractory	35,439	33,915	West Germany 15,256; Sweden 6,794.
Corundum (artificial)	446	NA	
Diamond and other precious, semiprecious stones:			
Diamonds, non-industrial, unset.—value, thousands	$1,080	$1,353	Belgium-Luxembourg $599; Switzerland $207.
Other stones, natural ---- do	$409	$502	Japan $318; Switzerland $104.
Dust and powder, including synthetic stone. ---- do	$189	$140	West Germany $84.
Diatomite and other siliceous earths	1,776	2,390	United States 1,855; West Germany 223.
Dolomite, including calcined	15,620	19,596	Norway 9,057; West Germany 3,598.
Earth pigments	366	324	West Germany 196.
Emery and other natural abrasives	3,265	5,027	Italy 2,585; West Germany 1,844.
Feldspar	[e] 5,499	[e] 7,400	NA.
Fertilizer materials:			
Crude:			
Phosphate rock	342,697	306,000	Morocco 201,376; U.S.S.R. 52,311.
Potash salts	745	700	All from West Germany.
Sodium nitrate	32,400	18,275	All from Chile.
Manufactured:			
Nitrogenous	600,479	450,358	Norway 391,328; West Germany 51,600.
Phosphatic, including Thomas slag.	90,178	42,964	Netherlands 21,389; West Germany 6,806; Belgium-Luxembourg 5,802.
Potassic	281,403	222,081	West Germany 136,104; East Germany 55,186.
Flint	47	NA	
Fluorspar	[e] 500	[e] 550	NA.
Graphite	367	410	Norway 199; West Germany 157.
Gypsum and anhydrite, including calcined.	100,633	95,617	Poland 85,362.
Lime	89	1,827	Sweden 1,124; West Germany 586.
Limestone (for cement, flux, etc.)	44,230	NA	
Magnesite, including calcined	4,715	5,554	Austria 4,676.
Mica:			
Scrap, ground, and other crude	268	305	Republic of South Africa 179, Norway 68.
Manufactures	73	51	West Germany 24.
Pyrite	142,719	130,161	Spain 82,712; Norway 47,449.
Quartz and quartzite	41,010	29,550	Sweden 28,016.
Salt	193,042	241,356	West Germany 145,121; United Kingdom 47,366.

See footnotes at end of table.

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Table 5.—Denmark: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Stone, sand, and gravel:			
Dimension stone:			
Granite, gneiss etc., unworked	40,968	41,259	Sweden 39,289.
Marble and other calcareous unworked.	11,622	212,087	Sweden 7,929; Norway 2,433.
Slate, unworked	7,053	9,557	Norway 5,352; West Germany 2,392.
Worked, all types	8,740	28,696	Portugal 17,896; Sweden 9,492.
Gravel and crushed stone	173,415	272,699	Sweden 240,024.
Sand	76,223	80,146	Belgium-Luxembourg 60,985; Sweden 14,110.
Sulfur:			
Elemental, all forms	13,784	10,404	United States 3,546; West Germany 3,503.
Dioxide and sulfuric acid	2,423	8,503	West Germany 3,777.
Talc and steatite	13,282	13,755	Norway 11,598.
Mineral substances, n.e.s	13,603	18,518	West Germany 11,417.
Slag and ash, n.e.s	.....	1,509	Sweden 504.
Mineral fuels:			
Asphalt and bitumen:			
Natural, crude	1,493	1,430	United States 817; Trinidad and Tobago 406.
Manufactures	1,425	1,638	West Germany 729; Sweden 726.
Carbon black	1,894	2,037	United Kingdom 846; West Germany 447.
Coal, including briquets. thousand tons	3,440	3,681	Poland 2,760; U.S.S.R. 607.
Coal tar and other derivatives	18,179	17,003	West Germany 6,208; United Kingdom 5,047.
Coke thousand tons	888	832	West Germany 340; U.S.S.R. 308.
Lignite, including briquets	150,682	135,639	East Germany 135,232.
Peat, including briquets and litter	7,559	8,184	Sweden 6,494; West Germany 1,310.
Petroleum:			
Crude and partly refined. thousand tons	3,396	4,671	Kuwait 1,287; Saudi Arabia 1,040; Nigeria 410.
Refinery products:			
Gasoline thousand tons	1,130	1,092	United Kingdom 277; Netherlands 223; West Germany 161.
Kerosine, including white spirit. do	413	422	United Kingdom 118; Netherlands 105; Italy 79.
Distillate fuel oil do	2,779	3,287	Italy 731; United Kingdom 689; Netherlands 409
Residual fuel oil do	2,769	2,740	United Kingdom 1,071; Netherlands 443; U.S.S.R. 331.
Lubricants, including grease. do	83	95	United Kingdom 35; United States 28 Netherlands 13.
Liquefied petroleum gases. do	86	92	West Germany 69; Netherlands 12.
Bitumen and other do	204	228	West Germany 65; Netherlands Antilles 53; United Kingdom 39.
Total do	7,464	7,956	

r Revised. e Estimate. NA Not available.
1 Not including synthetic corundum.
2 Including alloys.
3 Including spiegeleisen, grit, sponge, and powder of iron or steel.
4 Including wire rod.

GREENLAND

Greenland, Denmark's large island colony, contributed virtually nothing to world mineral supplies in 1967 except cryolite, and was an inconsequential mineral commodity consumer. The only mineral production recorded was that of coal (from a mine of Disco Island); recorded exports were confined to cryolite (all derived from stocks mined prior to 1963), marble monumental stone (quarried near Umanak), and coal.

All of the 1966 exports of coal and monumental stone, together with 50,172 tons of cryolite, were shipped to Denmark; the balance of the cryolite, 13,877 tons, was shipped to the United States.

Recorded 1966 mineral commodity exports were valued at about $3.4 million (23.5 million kroner) compared with total exports of $14.9 million (102.8 million kroner), while mineral imports were valued at about $5.2 million (36.2 million kroner) compared with total imports of $38.2 million (263.4 million kroner). Liquid fuels were by far the foremost commodity import group.

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Table 6.—Greenland: Production and exports of mineral commodities

(Metric tons)

Year	Production: Coal	Exports		
		Cryolite	Monumental stone	Coal
1963	40,000	67,130	------	4,687
1964	24,000	50,882	------	--------
1965	20,000	57,063	------	--------
1966	34,000	64,049	71	4,979
1967	32,000	p 68,000	------	NA

p Preliminary. NA Not available.

Table 7.—Greenland: Imports of metals and minerals

(Metric tons)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Iron and steel semimanufactures	2,906	2,568	All from Denmark.
Nonferrous metal semimanufactures	116	156	Do.
Nonmetals:			
Brick, stone, clay products	1,900	1,937	Do.
Cement	854	3,753	Do.
Expanded clays etc	587	439	Do.
Fertilizer materials, manufactured	54	48	Do.
Lime, burned	317	304	Do.
Salt	3,758	7,278	Spain 6,360; Denmark 418.
Other nonmetals:			
Crude	221	388	All from Denmark.
Processed	5,912	5,323	Do.
Mineral fuels:			
Coal, coke and briquets	8,878	5,988	United Kingdom 5,229; Denmark 737.
Gas, natural	332	277	All from Denmark.
Petroleum refinery products:			
Gasoline	4,786	5,235	Netherlands Antilles 2,596; Venezuela 1,508; Denmark 1,131.
Petroleum turpentine	8,130	5,408	Netherlands Antilles 4,147; Denmark 1,261.
Kerosine and diesel fuel	69,081	74,916	Netherlands Antilles 41,335; Venezuela 31,973.
Heavy fuel oil	5,852	6,107	All from Venezuela.
Other	1,980	1,827	NA.

NA Not available.

ICELAND

Iceland remained dependent upon imports to satisfy virtually all mineral consumption requirements. Recorded domestic mineral output was limited to foundry products, fertilizer materials, and a few industrial nonmetallics. A diatomite plant at Lake Myvatin was under construction during the year, with completion scheduled for mid-1968. The plant, which will introduce a new industry to the Icelandic economy, is 48 percent owned by Johns-Manville. The economic feasibility of the construction of a petroleum refinery in Iceland was under consideration during the year; the idea was abandoned when investigations showed that the refinery mix would not correspond to Iceland's consumption demands, which have predominately been for diesel oil.

Iceland's 1966 mineral commodity imports were valued at $22.9 million, approximately equal to those of 1965; pre-

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liminary statistics indicated an increase in import value to about $24.8 million in 1967. Over 53 percent of the total mineral commodity import expenditure during 1965–67 was for mineral fuels, predominantly petroleum products; other major commodity groups were iron and steel (21.6 percent), manufactured fertilizers (8.3 percent), and nonferrous metals (5.3 percent). The very modest recorded mineral commodity exports have consisted of scrap metal and in 1967 were valued at $209,000. The following tabulation shows the relationship of mineral trade to total trade:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	0.1	129.4	0.1
1966	.2	140.8	.1
Imports:			
1965	22.9	137.0	16.7
1966	22.9	159.0	14.4
Trade balance:			
1965	−22.8	−7.6	XX
1966	−22.7	−18.2	XX

XX Not applicable.

Table 8.—Iceland: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metal scrap: [1]					
Iron and steel	2,314	3,274	1,238	NA	2,191
Other	154	166	277	NA	
Nonmetals:					
Cement	98,500	108,100	114,100	114,600	115,904
Fertilizer materials: [2]					
Gross weight	e 19,500	e 20,100	e 19,500	22,735	23,904
Nitrogen content	6,500	6,700	6,500	e 7,500	e 7,900
Limestone (shell sand)—cubic meters	e 120,000	e 130,000	142,000	130,300	120,000
Pumice	12,500	10,000	e 10,000	e 10,000	NA
Rhyolite	NA	e 18,000	20,000	e 20,000	e 20,000
Sand and gravel—thousand tons	NA	NA	NA	NA	3,770

e Estimate. NA Not available.
[1] Exports, except for 1967.
[2] For 1963–65, quantities indicated are for agricultural period ending in year stated.

Table 9.—Iceland: Mineral commodity trade

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations or sources, 1966
EXPORTS			
Metals:			
Iron and steel scrap	1,238	1,743	NA.
Nonferrous metal scrap	277		
IMPORTS			
Metals:			
Aluminum and alloys, unwrought and semimanufactures.	365	482	Norway 123; West Germany 81.
Copper and alloys, unwrought and semimanufactures.	265	236	Denmark 78; West Germany 56; United Kingdom 55.
Iron and steel:			
Pig iron, scrap, ferroalloys and similar materials.	182	NA	
Steel:			
Billets and other crude forms	13	NA	
Semimanufactures:			
Bars, rods, sections	14,693	13,199	Belgium-Luxembourg 2,976; U.S.S.R. 2,686; Czechoslovakia 2,134.
Plates and sheets	10,590	10,268	West Germany 3,106; Belgium-Luxembourg 2,628.
Tubes, pipes and fittings	4,296	4,653	West Germany 1,655.
Other	1,076	675	NA.
Total	30,655	28,795	

See footnotes at end of table.

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Table 9.—Iceland: Mineral commodity trade—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations or sources, 1966
Metals—Continued			
Lead and alloys:			
Unwrought	235	304	NA.
Semimanufactures	133		
Platinum group metals, unwrought and semimanufactures. value, thousands	$14	NA	
Silver and alloys, unwrought and semimanufactures. troy ounces[1]	41,796	NA	
Tin and alloys long tons	18	NA	
Titanium dioxide	259	NA	
Zinc and alloys:			
Unwrought	8	NA	
Semimanufactures	77	NA	
Nonmetals:			
Asbestos (manufactured)	197	166	NA.
Barite and witherite	47	NA	
Cement	93	NA	
Chalk	122	NA	
Clay and clay products:			
Clays	167	NA	
Construction materials:			
Nonrefractory	892	987	NA.
Refractory	572	478	NA.
Diamond[2] and other precious and semiprecious stones. value, thousands	$5	NA	
Diatomite and other siliceous earths	519	NA	
Fertilizers: Manufactured:			
Nitrogenous	11,483	6,952	Belgium-Luxembourg 5,446.
Phosphatic	8,271	10,448	Norway 5,470; Netherlands 3,385.
Potassic	11,259	9,176	West Germany 5,400; Belgium-Luxembourg 3,375.
Ammonia	4,474	NA	
Gypsum and plasters	4,171	NA	
Lime	1,460	NA	
Salt	52,059	43,948	Spain 34,460.
Sodium and potassium hydroxides	465	NA	
Sulfur:			
Elemental, including refined	6	NA	
Sulfuric acid, including oleum	110	NA	
Talc and steatite	52	NA	
Mineral fuels:			
Asphalt and bitumen, natural	840	2,209	NA.
Coal, including briquets	8,037	5,006	Poland 4,554.
Coke and semicoke	940	804	Poland 234.
Petroleum refinery products:			
Aviation gasoline	15,510	4,796	Mostly from United Kingdom.
Motor gasoline	48,005	51,739	Mostly from the U.S.S.R.
Jet fuel	17,249	17,946	United Kingdom 10,507.
Kerosine, including white spirit	514		
Distillate fuel oil	262,878	274,719	U.S.S.R. 240,748; Netherlands Antilles 15,544.
Residual fuel oil	117,948	135,237	U.S.S.R. 111,216; United Kingdom 23,697.
Lubricants, including grease	4,796	5,293	United Kingdom 3,227; Netherlands 1,277.
Liquefied petroleum gases	374	NA	
Bitumen and other	3,567	3,579	Poland 2,711; United States 453.
Total	470,841	NA	
Crude chemicals from distillation of coal, petroleum or natural gas.	118	NA	

NA Not available.
[1] Calculated from quantities reported in metric tons.
[2] Including synthetic or reconstructed stones.

IRELAND

Returning in 1967 to the 4 percent growth rate that prevailed immediately prior to 1965, the Irish economy recovered from the slowdown of the previous 2 years. Exports provided the main stimulus for the recovery rising in value by over 16 percent, far outstripping the increase in imports (5 percent). Industrial produc-

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tion for the same year showed a growth rate of 8 percent, and productivity climbed almost 7 percent. The rise in consumer prices remained at the moderate rate of 3 percent.

The mineral industries achieved a much faster rate of advance in 1967 with virtually all sectors showing higher levels of production and exports. Record tonnages of metal ores were mined and processed as newly developed properties operated at capacity levels. At the same time, mineral exploration activity and development of recently discovered ore deposits were accelerated. Nonmetal mineral output was stimulated by the sharp rise in construction activity and the strong demand for products in the export market. Production of barite was cut back sharply in 1967 to compensate for the decline in export requirements.

In the mineral fuels sector, a notable development was the record output of petroleum refinery products (all from imported crude oil) owing to the full utilization of expanded refinery capacity and the stimulus of rising demand in both foreign and domestic markets. An upswing was also obtained in output of peat in 1967, while a moderate gain was recorded in production of coal. The trend of increased dependence on foreign petroleum to meet growing energy needs continued to prevail in 1967, as limited oil exploration indicated poor prospects for the discovery of significant reserves of crude oil.

Incentives to attract foreign investors to mining in Ireland became even more favorable n 1967 with the passage of legislation granting new mining ventures exemption from income taxes for 20 years.

The Irish pound was devalued (14.3 percent) simultaneously with the pound sterling on November 18, 1967. The effect of this action on Ireland's foreign trade will not be apparent until 1968.

PRODUCTION

Increases in output of concentrates of copper (almost three times the level for 1966), lead (46 percent), zinc (21 percent), and silver (70 percent) were attained in 1967 because optimum operating rates were achieved in the mining and treatment of ores. A 7-percent rise in the volume of building and construction activity in 1967, and strong demand in foreign markets, stimulated output of sand and gravel (12 percent), limestone (11 percent), cement (17 percent), and most other construction materials. Barite production for 1967 was down almost 40 percent as export markets deteriorated. In the mineral fuels sector, demand for peat remained strong in 1967, and total output of all types rose significantly (13 percent). The impact of petroleum refinery expansion is clearly reflected in the sharp upward trend in production of all refinery products, including jet fuel, which was produced, in quantity, for the first time in 1967. The bulk of the refinery output comprised residual and distillate fuel oils, which registered production gains of 54 percent and 52 percent, respectively. Coal output rose 4 percent, but estimates of coke output indicate a continuation of the downward trend that prevailed in 1966.

TRADE

Total mineral commodity imports of Ireland in 1967 amounted to $198.6 million, or about 3.7 times the value of exports ($53.7 million). Compared with that of the previous year, the value of exports was up over 28 percent while imports increased by 11 percent. Mineral commodity imports represented 18.2 percent of total imports in 1967, 1.1 percent over those of the previous year, while exports of these commodities accounted for 7 percent of total exports, up 0.7 percent from 1966 as shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	33.1	610.5	5.4
1966	41.8	658.8	6.3
1967	53.7	771.9	7.0
Imports:			
1965	180.2	1,040.6	17.2
1966	178.6	1,043.3	17.1
1967	198.6	1,093.5	18.2
Trade balance:			
1965	−147.1	−430.1	XX
1966	−136.8	−384.5	XX
1967	−144.9	−321.6	XX

XX Not applicable.

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Table 10.—Ireland: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Copper, metal content of ore	------	------	------	r 1,263	3,528
Lead, metal content of ore	------	1,200	2,588	r 40,000	58,300
Silver, metal content of ore thousand troy ounces	------	------	------	1,218	2,067
Steel ingots and castings thousand tons	r 32	r 53	r 66	e 66	NA
Zinc, metal content of ore	------	------	1,437	r 24,800	30,000
Nonmetals:					
Barite thousand tons	14	41	84	125	76
Cement do	r 883	r 1,036	r 1,239	r 1,113	1,298
Construction materials: [1]					
Sand and gravel do	1,616	r 2,225	2,204	2,358	22,649
Limestone do	2,356	r 3,150	r 3,558	4,359	4,820
Gypsum do	204	232	218	NA	NA
Lime do	r 36	r 43	42	41	42
Superphosphate (P_2O_5 content) do	61	71	42	70	NA
Other [2] do	r 1,868	r 2,142	2,316	2,383	2,431
Mineral fuels:					
Coal:					
Anthracite do	149	153	118	121	111
Semibituminous do	r 84	77	66	54	71
Coke, gas plant, including coke breeze do	r 128	r 131	r 105	r 100	e 80
Peat:					
Briquets do	286	296	r 256	r 230	309
Milled [3] do	795	1,336	1,490	2,031	2,465
Sod do	2,759	2,481	r 2,209	2,177	2,230
Moss do	25	24	28	29	37
Petroleum refinery products:					
Gasoline thousand 42-gallon barrels	2,895	3,278	3,644	2,989	3,826
Jet fuel do	------	------	------	------	199
Distillate fuel oil do	3,590	3,911	4,493	3,372	5,194
Residual fuel oil do	4,462	5,076	5,930	4,175	6,350
Other do	345	277	471	253	695
Refinery fuel (including losses) do	704	692	744	759	757

e Estimate. p Preliminary. r Revised. NA Not available.

[1] Figures do not include large quantities of granite, stone, sand and gravel, and other materials used by government agencies.

[2] Includes granite, marble, silica rock-sand-clay, igneous rock, calcspar, fireclays, shale and clay for burning cement.

[3] Includes milled peat used to make briquets except 1963 and 1964.

Major mineral exports in 1966, on the basis of their share of total mineral commodity export value, were metalliferous ores and scrap (39 percent), nonferrous metals (14 percent), cement and building products (13 percent), clays and refractory construction materials (almost 8 percent), iron and steel products (7 percent), and petroleum and products (over 6 percent). The export value of metalliferous ores and scrap ($16.4 million) was 3.6 times the level for 1965, and exports of nonferrous metals ($6 million), crude fertilizer and other select minerals ($2.4 million) and clays and refractory construction materials ($3 million), were up 50, 22, and 33 percent, respectively. The value of exports of most other mineral commodities in 1966 was below the level for 1965 with petroleum and petroleum products down nearly 60 percent; cement and building products down 5 percent; iron and steel products down 31 percent; and coal-coke-briquets down 5 percent.

The United Kingdom remained by far the largest export market for Ireland's mineral commodities, receiving 48 percent of the total export value. Common Market countries received 34 percent, including 11.4 percent to West Germany, 9 percent to Belgium-Luxembourg, and 5.6 percent to the Netherlands.

On the import side, petroleum and petroleum products (36.6 percent), iron and steel products (15.7 percent), coal, coke, and briquets (13.4 percent), nonferrous metals (12.9 percent), and manufactured fertilizers (7.4 percent) remained the most important categories by value. Imports of nonferrous metals registered the largest increase in 1966, rising 21.7 percent to $23 million, while imports of coal, coke, and briquets rose 2.6 percent to $2.4 million, and imports of petroleum and petroleum products were up 2 percent to $65.3 million. In contrast, imports of manufactured fertilizers valued at $13.3 million were down about 28 percent, and

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those of iron and steel products, valued at $28.1 million, declined over 19 percent.

Western Europe supplied 63.5 percent of Ireland's mineral commodities imports in 1966, principally the United Kingdom (45.2 percent) and EEC countries (16.5 percent). In terms of value, the significant sources of imports, outside Western Europe, were Iraq (11.2 percent), the United States (5 percent), Canada (3.8 percent), Poland (3.8 percent), and Iran (3.1 percent).

Table 11.—Ireland: Exports [1] of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum and alloys:			
Scrap	1,226	1,352	Netherlands 578; United Kingdom 409.
Unwrought and semimanufactures	4,096	5,592	United Kingdom 5,018.
Copper and alloys:			
Scrap	3,521	4,353	West Germany 1,242; United Kingdom 974; Netherlands 821; Spain 771.
Unwrought and semimanufactures	1,758	1,577	West Germany 428; Netherlands 341; United Kingdom 315.
Iron and steel:			
Scrap	35,113	18,640	Spain 10,708; United Kingdom 3,057; Belgium-Luxembourg 2,475.
Steel ingots and other primary forms.	52,724	11,241	Denmark 6,320; Spain 2,871; Sweden 2,049.
Semimanufactures	8,732	18,370	United Kingdom 18,169.
Lead and alloys:			
Scrap	885	809	United Kingdom 764.
Unwrought and semimanufactures	525	259	United Kingdom 228.
Tin—long tons	------	49	United Kingdom 45.
Unspecified nonferrous ores and concentrates.	589	115,617	Belgium-Luxembourg 41,909; France 31,527; West Germany 21,817.
Nonmetals:			
Barite	97,221	129,878	United States 123,600.
Cement—thousand tons	337	287	All to United Kingdom.
Fertilizer materials:			
Crude	13,198	15,299	Do.
Manufactured	8,845	15,956	Do.
Gypsum and plasters—thousand tons	104	103	Mainly to United Kingdom.
Stone, sand and gravel:			
Dimension stone, crude and worked	144	144	All to West Europe.
Gravel and crushed stone—thousand tons	194	242	West Germany 107; United Kingdom 78; Netherlands 55.
Clay products:			
Refractory	23,903	30,785	United Kingdom 14,391.
Other	14,104	18,553	United Kingdom 11,927.
Mineral fuels:			
Coal	-------	6,394	All to United Kingdom.
Coal briquets and peat	52,090	57,570	United Kingdom 52,187.
Coke	48,044	31,258	Norway 31,162.
Petroleum refinery products:			
Gasoline.—thousand 42-gallon barrels	86	71	All to United Kingdom.
Distillate fuel oil—do	1,558	637	Do.
Residual fuel oil—do	428	84	Do.
Liquefied petroleum gas (LPG)	1,688	1,032	Do.
Crude chemicals from coal and petroleum distillation.	11,199	8,787	United Kingdom 3,636; Netherlands 2,509.

[1] Excluding reexports.

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Table 12.—Ireland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys:			
Unwrought	7,831	10,353	Canada 10,038.
Semimanufactures	4,048	4,927	United Kingdom 3,272; Belgium-Luxembourg 540.
Copper and alloys:			
Unwrought	29	158	All from United Kingdom.
Semimanufactures	7,231	7,146	United Kingdom 6,444.
Iron and steel:			
Iron ore and concentrate	1,262	724	United Kingdom 419; France 203.
Scrap	586	-------	
Pig iron, cast iron, powder, shot, and sponge iron.	22,810	21,244	West Germany 12,574; East Germany 5,011.
Ingots, blooms, billets, slabs, coils for rerolling, and pipe blanks.	52,298	NA	
Semimanufactures:			
Wire rod	15,931	16,813	West Germany 8,691; United Kingdom 3,239; France 2,228.
Bars and other rod	12,516	14,107	United Kingdom 7,863; West Germany 2,621.
Plate and sheet	68,226	70,963	United Kingdom 50,487; Belgium-Luxembourg 6,390.
Hoop and strip	4,132	4,572	United Kingdom 3,675; West Germany 587.
Rails and railway track materials	8,166	6,081	United Kingdom 4,764; Belgium-Luxembourg 868.
Wire	5,589	4,695	United Kingdom 3,764.
Pipe, tube, and fittings	28,603	25,659	United Kingdom 15,882; Netherlands 4,080.
Castings	231	178	United Kingdom 81; West Germany 67.
Lead:			
Oxides	1,391	1,373	United Kingdom 1,357.
Metals and alloys, unwrought and semimanufactures.	469	436	United Kingdom 377.
Nickel and alloys, unwrought and semimanufactures.	94	115	United Kingdom 103.
Silver, all forms----value, thousands	$216	$337	Mainly from United Kingdom.
Silver and/or platinum ore	70	-------	
Tin and alloys, unwrought and semimanufactures. long tons	47	62	United Kingdom 57.
Titanium oxide	2,173	1,778	United Kingdom 1,150; West Germany 300.
Zinc:			
Oxides	596	805	United Kingdom 534; West Germany 221.
Metals and alloys:			
Unwrought	3,328	3,147	Belgium-Luxembourg 2,103.
Semimanufactures	269	203	United Kingdom 145.
Other:			
Ores and concentrates	7,886	17,914	Mozambique 17,872.
Scrap, nonferrous	112	540	United Kingdom 536.
Nonmetals:			
Abrasives:			
Natural, n.e.s	1,132	-------	
Grinding stones	237	243	United Kingdom 177; West Germany 42.
Asbestos	5,089	6,034	Canada 1,787; Republic of South Africa 1,741; U.S.S.R. 1,240; Cyprus 871.
Cement----thousand tons	31	173	United Kingdom 151.
Clay:			
Crude refractory materials, n.e.s	22,804	28,351	Yugoslavia 16,062; United Kingdom 9,443.
Products including brick:			
Refractory	r 10,165	10,836	United Kingdom 9,341; Canada 861.
Other	5,676	4,771	United Kingdom 3,548; West Germany 580; Sweden 463.
Fertilizer materials:			
Crude:			
Nitrogenous----thousand tons	1	1	Mainly from Chile.
Phosphatic----do	244	259	Mainly from Morocco.
Manufactured:			
Nitrogenous----do	116	26	Belgium-Luxembourg 8; United Kingdom 6; Netherlands 5.
Phosphatic:			
Thomas slag----do	153	90	Belgium-Luxembourg 88.
Other----do	33	9	Belgium-Luxembourg 6; United Kingdom 3.
Potassic----do	160	160	East Germany 48; France 46; West Germany 33.
Mixed----do	3	26	United Kingdom 22.
Ammonia, anhydrous	14,963	4,226	United Kingdom 3,149; France 1,065.
Lime	5,364	3,699	All from United Kingdom.
Limestone and dolomite	3,327	1,556	United Kingdom 1,100.

See footnotes at end of table.

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Table 12.—Ireland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Pigments, mineral (iron oxides and hydroxides).	1,315	1,256	United Kingdom 784; West Germany 248.
Salt----thousand tons	42	44	United Kingdom 35.
Sodium and potassium compounds, n.e.s.:			
Caustic soda	3,221	4,415	United Kingdom 3,633.
Caustic potash and peroxides of sodium and potassium.	248	244	United Kingdom 210.
Stone, sand and gravel, n.e.s.:			
Dimension stone:			
Crude or roughly cut	2,992	2,814	United Kingdom 1,205; Italy 1,159.
Worked	666	504	United Kingdom 424.
Sand, excluding metal bearing	39,411	38,820	Belgium-Luxembourg 28,764; United Kingdom 10,034.
Gravel and crushed stone	21,947	27,834	United Kingdom 27,636.
Sulfur and pyrite:			
Pyrite, unroasted	2,206	1,981	All from Spain.
Sulfur, elemental	53,375	86,657	United States 66,246; France 19,466.
Sulfuric acid	193	1,289	Netherlands 1,036.
Other nonmetals: Quartz, crude mica, feldspar, and fluorspar.	4,524	3,804	United Kingdom 2,224; Norway 1,567.
Mineral fuels:			
Asphalt and bitumen, natural	-------	794	Trinidad and Tobago 790.
Coal, coke, and briquets:			
Coal----thousand tons	1,289	1,332	Poland 423; United Kingdom 394; United States 315.
Coke----do	12	15	United Kingdom 9.
Briquets----do	6	5	Mainly from United Kingdom.
Gas, natural, including LPG	9,058	16,353	United Kingdom 15,932.
Petroleum:			
Crude thousand 42-gallon barrels and partly refined.	15,186	11,693	Iraq 8,107; Iran 2,277; Saudi Arabia 1,309.
Refinery products:			
Gasoline----do	269	975	United Kingdom 608; Israel 268.
Kerosine and jet fuel---do	1,666	1,813	United Kingdom 1,775.
Distillate fuel oil----do	208	661	United Kingdom 559.
Residual fuel oil----do	2,687	4,283	United Kingdom 2,720; U.S.S.R. 874; Italy 306.
Lubricating oils and greases	r 266	180	Mainly from United Kingdom.
Mineral jelly and waxes	1,846	2,918	United Kingdom 995; West Germany 511; United States 436.
Miscellaneous chemicals from the distillation of coal, gas and petroleum.	10,626	9,668	United Kingdom 9,661.

r Revised. NA Not available.

Source: Statistical Office of the United Nations.

COMMODITY REVIEW

Metals.— *Copper, Lead, Zinc, and Silver.*—In 1967 record tonnages of copper-lead- zinc and silver concentrates were produced in Ireland, as optimum operating rates were achieved in the mining and treatment of ores from the Tynagh mine of Irish Base Mineral Limited, a subsidiary of Northgate Exploration Limited. The Tynagh mine, in County Galway, is basically a lead-zinc deposit, however, appreciable quantities of silver and copper are present in the ores and recoverable as byproducts. In the first 2 years of operation, more than 3 million ounces of silver concentrate has been recovered. The mine now ranks as the leading individual lead-zinc-silver ore producer in West Europe. The processing plant has a rated daily capacity of 2,000 tons.

Gortdrum Mines (Ireland) Limited, another subsidiary of Northgate Exploration Limited, initiated production in 1967 from its coppersilver mine in County Tipperary. The first shipments of concentrate was made in November 1967. Processing of ores at capacity level of 1,500 tons daily is expected to be attained early in 1968.

Northgate Exploration was also active in other areas in Ireland, operating through subsidiary organizations and, in some instances, with other corporate entities.

The lead-zinc-silver mine under development at Silvermines in County Tipperary by Consolidated Mogue Mines Limited is expected to become operational early

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in 1968. Work has been completed on the mine shaft and stations, surface building, and the 3,000-ton-per-day ore processing plant.

The success of Northgate Exploration Limited and the presence of favorable tax concessions have attracted numerous foreign mining enterprises to Ireland. Under provisions of the Finance Act of 1967, corporate profits from mining operations are exempt from income tax for 20 years. The Act includes any new mine brought into production before 1986. The 1967 Act superseded previous legislation that granted a tax exemption during the first 4 years of production, and a 50 percent tax rate for the succeeding 4 years. By 1967, more than 400 prospecting permits had been issued to over 60 foreign mining companies from United States, the United Kingdom, Canada, France, Belgium, and Australia, including American Smelting and Refining Company, and Rio Tinto-Zinc Corporation. These permits cover large areas in 25 of the 26 counties in Ireland.

Nonmetals.—*Barite.*—Declining demand in overseas markets resulted in a 42 percent decline in 1967 barite exports, and was responsible for production falling by nearly 40 percent, from 125,000 tons in 1966 to 76,000 tons in 1967. Virtually the entire output was from the open-cast mine at Ballynoe, operated by Magnet Cove Barium Limited of Ireland (Magcobar). This company is a subsidiary of Dresser A.G., Zurich, and operates the mine on behalf of the lessee, Magnet Cove Barium Corporation, Houston, Tex.

Building materials.—The significant change in the nonmetals sector in 1967 was the sharp upward trend in production of sand and gravel, cement, and limestone, stemming primarily from increased building and construction activity and a sharp rise in export demand.

Mineral Fuels.—The Government of Ireland is committed to a policy of using indigenous fuels to the greatest extent possible. Nevertheless, the trend toward increased reliance on imported liquid fuels to meet the nation's growing energy requirements continued in 1967. Liquid fuels' share of total primary energy consumption is expected to rise to 69 percent in 1980 compared with 49 percent in 1965.

Expansion of the Whitegate petroleum refinery of Irish Refining Company, Limited, completed in 1966, increased crude throughput capacity from 2 million to 2.5 million tons per year. The added capacity included facilities to increase output of premium grade gasoline and jet fuel, which was produced in quantity for the first time in 1967. Refinery output was almost at capacity level in 1967, and accounted for 65 percent of Ireland's total supply, as compared with 54 percent in 1966 and 70 percent in 1965. Ireland's consumption of petroleum products, nearly 2.7 million tons in 1967, was up almost 18 percent from that of 1966, while imports increased slightly over 6 percent, and exports and bunkers soared to three times the 1966 level.

Gulf Oil Company's new oil storage depot on Shiddy Island in Bantry Bay off the southwest coast was formally inaugurated in April 1967. Initial storage capacity is about 1 million tons, comprised of 12 tanks, each with a capacity of approximately 80,000 tons. Port facilities are capable of accommodating supertanker of up to 300,000 tons deadweight. The depot was established as a crude oil distribution center for refineries in northern Europe.

Oil exploration was continued on a small scale at select sites by Ambassador Oil Company in partnership with Marathon Oil Company, but no commercial quantities of reserves had been found at yearend.

Indigenous coal production remained relatively stable at about 182,000 metric tons in 1967, but coal imports at 1,258,000 tons were down 6 percent as gas coal receipts from foreign suppliers declined 27 percent. Continued displacement of coal by liquid fuels in 1967 was the principal factor in the estimated decrease of 24 percent in coke output. Production of peat fuels increased in 1967, in line with government efforts for maximum utilization of indigenous mineral fuels resources.

SWITZERLAND

Switzerland's commercial domestic mineral resources are limited to a few nonmetallic minerals. The Country's aluminum, iron and steel, and petroleum refin-

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ing industries use imported raw materials. Significant increases in the 1967 output of refining and other processing industries was attributed to expansion and modernization, particularly in the aluminum processing industries and to the full capacity operation of the Aigle petroleum refinery.

During 1967, the nation's major mineral activity was centered about energy supply. Petroleum is the major source of the nation's energy, suppying about 70 percent of the total. Petroleum product requirements are partially satisfied by the output of the nation's two refineries, the Aigle (40,000 barrels per day) and the Cressier (50,000 barrels per day), both operating principally on Middle East crude. While the Aigle refinery operated at full capacity in 1967, the Cressier refinery was not yet operating at capacity level.

Hydroelectric power, Switzerland's only significant totally domestic energy source, has attained its fully economic development potential, forcing the nation to seek nuclear power development. The Government has encouraged extensive uranium exploration activities. During the year, seams were found in Glarus, Grisons, St. Gallen, and Valais. The feasibility of commercial exploitation of these deposits have not yet been established. During the year, two nuclear powerplants were under construction, the 360-megawatt Beznau I scheduled for completion in 1969, and a 300-megawatt plant at Muehleberg scheduled for completion in 1971.

Switzerland's mineral industry remained a small contributor to the nations's export earnings in 1966, but mineral commodity imports remained a significant part of total imports, as shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1965	189.0	2,939.0	6.4
1966	206.7	3,251.6	6.4
Imports:			
1965	720.1	3,671.1	19.6
1966	754.3	3,917.6	19.3
Trade balance:			
1965	−531.1	−732.1	XX
1966	−547.6	−666.0	XX

XX Not applicable.

Although the European Economic Community (EEC) again in 1966 provided the overwhelming share of Switzerland's total mineral imports, these nations together accounted for a diminishing share of the total, 65.5 percent, as compared with 72.8 percent in 1965, and the total value of imports from these countries fell by $29.8 million to $494.3 million. In contrast, mineral commodity imports from countries of the European Free Trade Association (EFTA) to which Switzerland belongs increased from 10.5 percent ($75. million) of the total in 1965 to 12 percent ($90.7 million) in 1966.

Principal suppliers of imports were West Germany (1965—$191.8 million, 1966—$184.8 million), France (1965—$152.6 million, 1966—$144 million), and Belgium Luxembourg (1965—$76.2 million, 1966—$72.4 million). A $11.5 million increase in receipts from the United States was recorded in 1966 over the $28.6 million of 1965, and an equal increase was reported in imports from Communist Europe, from $18.1 million to $29.6 million.

The value of Swiss shipments to both EEC and EFTA countries increased between 1965 and 1966, but both areas share of the total declined, that of the EEC from 57.6 percent to 54.3 percent and that of the EFTA from 23 percent to 22.7 percent. West Germany and France, the leading sources of mineral imports, were also the first-ranked destinations for Switzerland's mineral exports, the former receiving materials valued at $52.6 million in 1965 and $50.6 million in 1966 and the latter receiving goods valued at $23 million in 1965 and $23.9 million in 1966. In 1965, the United Kingdom and Italy ranked third and fourth with $20 million and $18.2 million, respectively, while in 1966, these countries were reversed in order with Italy receiving $23.7 million and the United Kingdom receiving $19.9 million. Exports of mineral commodities to the United States increased by $600,000 to $11.1 million in 1966, while shipments to Communist Europe rose from $1.8 million to $4 million.

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Table 13.—Switzerland: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967 [p]
Metals:					
Aluminum	60,110	64,235	67,150	68,725	72,320
Iron and steel:					
Iron ore—thousand tons	96	90	113	66	4
Pig iron—do	42	30	25	25	24
Ferroalloys (ferrosilicon)—do	2	2	2	2	2
Ingots and other equivalent primary forms.—thousand tons	322	345	345	428	420
Castings—do	15	25	25	28	25
Rolled	-------	-------	-------	460	480
Nonmetals:					
Cement—thousand tons	3,581	4,322	4,039	4,326	4,176
Gypsum [e]—do	100	100	100	100	100
Lime, hydraulic	184,426	200,041	176,585	166,717	152,970
Salt	190,716	181,571	230,368	183,361	216,371
Slate	458	422	317	262	176
Mineral fuels:					
Asphalt (export)	1,731	3,571	2,638	2,941	2,349
Coke, gas plant	[r] 527,990	469,159	452,300	408,614	275,000
Tar and pitch, gas plant	29,367	26,482	25,800	24,350	NA
Gas, manufactured—million cubic feet	12,357	11,994	12,334	12,255	NA
Petroleum refinery products:					
Gasoline	15,000	157,000	223,000	407,000	693,000
Jet fuel (kerosine type)	-------	8,000	6,000	19,000	60,000
Distillate fuel oil	82,000	367,000	444,000	923,000	1,624,000
White spirit and special boiling point liquids	2,000	27,000	44,000	10,000	NA
Liquefied petroleum gas	-------	-------	-------	-------	201,000
Residual fuel oils	51,000	298,000	368,000	750,000	1,271,000
Other	-------	-------	-------	3	74,000

[p] Preliminary. [r] Revised.

[1] In addition to commodities listed, unreported quantities of several metals, including copper, magnesium, nickel, and zinc were produced from scrap. Building stone, limestone for cement, crushed rock, coal briquets, and peat were also produced but output is not reported.

Table 14.—Switzerland: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum:			
Alumina and aluminium hydroxide	112	103	West Germany 56; United States 13.
Metals and alloys:			
Scrap	3,232	------	
Unwrought	16,186	22,465	United Kingdom 7,056; West Germany 6,490; Italy 3,765.
Semimanufactures	22,889	24,340	Austria 2,672; United Kingdom 2,393; Sweden 2,383.
Cobalt oxides and hydroxides	3	2	All to France.
Copper:			
Matte	318	160	Italy 67; West Germany 40; France 34.
Metal and alloys:			
Scrap	12,240	11,203	West Germany 5,442; Italy 2,016; Hungary 1,025.
Unwrought	3,717	4,023	Italy 2,027; West Germany 1,458.
Semimanufactures	8,240	11,010	United States 3,845; Italy 1,466; Israel 834.
Gold and alloys:			
Bullion and other unwrought.—thousand troy ounces	839	NA	
Semimanufactures.[1]—thousand troy ounces	60	NA	
Iron and steel:			
Iron ore, including roasted pyrite	96,833	31,652	All to West Germany.
Metal:			
Scrap	32,690	16,841	Italy 8,697; West Germany 3,721; France 2,783.
Pig iron [2]	496	317	West Germany 151.
Ferroalloys	13,005	9,945	West Germany 5,673; Italy 3,046.

See footnotes at end of table.

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Table 14.—Switzerland: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals—Continued			
Iron and steel—Continued			
Metal—Continued			
Ingots and equivalent forms	1,469	3,910	Italy 3,818.
Semimanufactures:			
Bars, rods, angles, shapes and sections.	28,028	43,523	West Germany 28,429; Italy 8,764.
Universals, plates and sheets.	1,647	2,034	West Germany 739; Austria 626; Italy 424.
Hoop and strip	1,234	1,756	Austria 565; Denmark 432; West Germany 250.
Rails and railway track materials.	492	351	Austria 158.
Wire	4,257	4,505	Italy 1,201; France 760; Belgium-Luxembourg 618.
Pipes, tubes, and fittings	34,158	37,452	United States 8,429; Austria 3,823; France 3,131.
Rough castings and forgings	113	179	Italy 57; West Germany 51; France 35.
Total	69,929	89,800	
Lead and alloys:			
Scrap	10,620	5,483	Italy 5,463.
Unwrought	350	------	
Semimanufactures	135	162	Austria 58; France 49; Belgium-Luxembourg 39.
Magnesium and alloys, all forms	86	109	West Germany 77; Austria 14.
Manganese ore	4,801	------	
Mercury, 76-pound flasks	29	87	NA.
Molybdenum, unwrought and semimanufactures.	1	--------	
Nickel:			
Matte and speiss	13	------	
Metal and alloys:			
Scrap	802	645	Italy 355; West Germany 89; France 65.
Semimanufactures:			
Anodes	193	301	France 102; West Germany 67; Netherlands 31.
Other	885	709	Italy 145; Finland 70; West Germany 68.
Platinum group metals, all forms. thousand troy ounces	66	NA	
Silver and alloys:			
Ingots, bars, and equivalent forms. do	1,107	NA	
Semimanufactures [1] do	3,908	NA	
Silicon metal	3,630	3,863	West Germany 2,448.
Tantalum and alloys, all forms	4	10	United States 5; West Germany 1; United Kingdom 1.
Tin:			
Scrap long tons	134	86	West Germany 53; France 21.
Unwrought and semimanufactures. do	69	81	West Germany 23; Austria 21; Denmark 15.
Tungsten and alloys, all forms	32	24	West Germany 22.
Zinc and alloys:			
Scrap and dust	937	1,085	Italy 889.
Unwrought	161	643	Mainly to Italy.
Semimanufactures	5	16	France 10.
Other metals:			
Residues, sweeping and waste:			
Of silver and platinum group metals.	71	68	West Germany 31; France 12.
Other	14,227	14,902	West Germany 5,358; Italy 4,986; Belgium-Luxembourg 3,484.
Metals and alloys:			
Alkali, alkaline earth, and rare-earth elements.	501	NA	
Nonferrous base metals, n.e.s.	9	16	West Germany 9; United Kingdom 4.
Nonmetals:			
Asbestos	92	85	West Germany 35.
Cement	142,014	138,531	West Germany 70,184; France 57,433.
Chalk	2	NA	
Clays and clay products:			
Clay	3,399	5,710	NA.
Refractory brick and other materials	524	859	United Kingdom 594; West Germany 81.
Nonrefractory products	52,916	59,194	West Germany 30,535; France 14,242; Austria 11, 642.
Diamond: Industrial, including bort. thousand carats	115	NA	

See footnotes at end of table.

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Table 14.—Switzerland: Exports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Nonmetals—Continued			
Diatomite and other infusorial earth	93	74	Austria 53.
Dolomite	117	NA	
Feldspar, fluorspar and nepheline syenite	37	119	Mainly to West Germany.
Fertilizer materials, manufactured:			
Nitrogenous	29,153	31,923	France 17,909; United Kingdom 8,671.
Mixed	45	54	NA.
Gem stones, dust and powder, including diamond dust. thousand carats	28,290	NA	
Gypsum and limestone:			
Gypsum and plasters	69	111	NA.
Limestone, industrial	83	NA	
Lime	2,672	2,153	France 1,318; West Germany 808.
Magnesite	39	NA	
Mica:			
Crude and partly worked	5	5	West Germany 1.
Worked	152	161	Austria 28.
Salt	3,187	2,079	Mainly to West Germany.
Sodium compound: Caustic soda	1,779	564	Austria 187.
Stone, sand and gravel:			
Quartz and quartzite, crude, ground and roughly squared.	21,456	19,783	Italy 16,025; West Germany 1,172.
Dimension stone, crude roughly split and roughly squared.	27,957	31,604	West Germany 22,966; Austria 2,929; Italy 1,947.
Gravel and crushed rock, not elsewhere specified.	66,547	57,373	West Germany 31,808; Austria 12,209; France 12,193.
Sand excluding metal-bearing	25,603	25,409	France 10,910; Austria 8,181.
Grinding and polishing stones and wheels.	571	616	West Germany 233; United Kingdom 102.
Dimension stone, worked including slate, flagstone, and paving blocks.	4,620	5,692	West Germany 4,581; Netherlands 592.
Sulfur: Sulfuric acid	26,550	6,759	West Germany 6,307.
Sulfur, elemental	------	297	All to West Germany.
Talc, soapstone, and steatite	1,276	------	
Other nonmetallic materials:			
Bromine, fluorine, and iodine	12,376	13,667	Mainly to West Germany.
Mineral substances, n.e.s	342	1,799	NA.
Mineral fuels:			
Asphalt and bitumen, natural, crude	2,638	2,942	United Kingdom 2,908.
Coal, peat, coke, and briquets thereof	288	792	NA.
Carbon black	315	209	Italy 133.
Hydrogen and inert rare gases	15	4	France 3.
Petroleum refinery products:			
Gasoline thousand tons	22	16	Mainly to Austria.
Kerosine do	4	------	
Fuel oils:			
Distillate do	20	11	Mainly to Austria.
Residual do	87	107	All to Austria.
Lubricants do	2	2	Mainly to Italy.
Petroleum coke do	10	7	France 5; West Germany 2.
Coal, petroleum, and natural gas chemical, not further described.	2,750	1,780	West Germany 1,314; Italy 328.

NA Not available.
[1] Including rolled gold or silver.
[2] Including sponge iron, shot, grit, and pellets.

Table 15.—Switzerland: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum:			
Bauxite	2,917	1,985	Italy 1,553.
Alumina	136,379	134,672	France 64,544; Guyana 36,776; Guinea 30,531.
Metal and alloys:			
Unwrought, including scrap	12,248	13,387	Norway 4,705; Austria 4,325; U.S.S.R. 3,193.
Semimanufactures	6,878	7,253	West Germany 4,816; United Kingdom 488.

See footnotes at end of table.

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Table 15.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Antimony metal, all forms	208	NA	
Arsenic, white	79	NA	
Beryllium metal, all forms	(1)	(1)	
Chromium:			
Ore and concentrate	3,559	3,354	U.S.S.R. 1,979; Mozambique 1,187.
Oxide and hydroxide	469	475	West Germany 249; United Kingdom 96.
Cobalt oxides and hydroxides	7	11	Belgium-Luxembourg 9.
Copper and alloys:			
Matte	116	445	Italy 241; United States 102; West Germany 93.
Metal and alloys:			
Scrap	428	547	West Germany 215; Israel 181.
Unwrought	42,393	42,846	Belgium-Luxembourg 15,531; Zambia 10,725; West Germany 5,066.
Semimanufactures	24,513	23,565	United Kingdom 9,481; West Germany 4,588; Canada 2,502.
Gold and alloys:			
Bullion and other unwrought. thousand troy ounces	245	NA	
Semimanufactures [2] do	154	NA	
Iron and steel:			
Iron ore, including roasted pyrite	2,603	7,240	Brazil 3,822; Italy 1,328; West Germany 1,096.
Metal:			
Scrap	5,002	52,943	East Germany 40,773; West Germany 8,728.
Pig iron [3]	66,586	64,698	West Germany 32,257; United Kingdom 8,845.
Ferralloys	13,179	16,527	Czechoslovakia 5,962; West Germany 3,387; East Germany 1,260.
Ingots and equivalent forms	188,562	166,032	France 69,703; West Germany 57,045.
Coils for rerolling	3,011	6,257	West Germany 3,868; France 1,151.
Semimanufactures:			
Wire rod thousand tons	65	48	France 20; West Germany 14.
Bars and other rods. do	160	140	West Germany 61; France 45; Austria 10.
Angles, shapes, and sections. do	204	188	West Germany 71; France 65; Belgium-Luxembourg 44.
Universals, plates and sheets. do	450	461	France 151; West Germany 139; Austria 40.
Hoop and strip do	123	133	Belgium-Luxembourg 41; Austria 29; Germany 29.
Rails and railway track materials. do	50	48	Austria 16; West Germany 11; Belgium-Luxembourg 7.
Wire do	22	21	West Germany 9; Austria 5.
Tubes, pipes, and fittings. do	129	115	West Germany 63; France 20; Italy 12.
Rough castings and forgings. do	3	3	West Germany 2.
Total do	1,206	1,157	
Lead:			
Oxides	476	323	West Germany 116; Mexico 116.
Metal and alloys:			
Unwrought, including scrap	23,929	21,010	France 3,595; Belgium-Luxembourg 3,560; Canada 3,342.
Semimanufactures	537	517	West Germany 423.
Magnesium, all forms	524	677	Norway 564; United Kingdom 43.
Manganese and alloys:			
Ore	1,196	460	Japan 51.
Oxide	r 651	475	Japan 329; France 51.
Mercury 76-pound flasks	957	759	Spain 546; Italy 91; West Germany 60.
Molybdenum metal, all forms	21	11	Austria 5; United States 3; West Germany 2.
Nickel:			
Ore and concentrate	-------	49	United Kingdom 25; Canada 11; West Germany 11.
Metal and alloys:			
Scrap	12	-------	
Unwrought, including matte and speiss.	971	1,359	United Kingdom 837; Norway 379; Canada 120.
Semimanufactures:			
Anodes	135	117	United Kingdom 33; Norway 29; Finland 19.
Other	1,285	989	West Germany 367; United Kingdom 322.

See footnotes at end of table.

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Table 15.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals—Continued			
Platinum group metals, all forms. thousand troy ounces	47	NA	
Silver and alloys:			
Ingots, bars, and equivalent forms. do	4,190	NA	
Semimanufactures [2] do	2,179		
Silicon metal	544	NA	
Tantalum and alloys, all forms. kilograms	3,239	1,000	Mainly from West Germany.
Tin:			
Oxide long tons	34	35	West Germany 24; United Kingdom 10.
Metal and alloys:			
Unwrought do	966	865	Netherlands 344; Malaysia 344.
Semimanufactures do	88	141	Netherlands 62; West Germany 38.
Titanium oxides	7,065	6,983	West Germany 3,100; United Kingdom 2,173.
Tungsten:			
Ore and concentrate	25	45	Congo (Kinshasa) 30; Australia 15.
Metal, all forms	33	51	West Germany 42; France 5.
Uranium, thorium and alloys. kilograms	35	NA	
Zinc:			
Oxide and peroxide	1,677	1,420	West Germany 512; France 260; Netherlands 259.
Metal:			
Unwrought: including scrap and dust.	27,287	24,738	Belgium-Luxembourg 11,526; West Germany 5,880; Congo (Kinshasa) 2,249.
Semimanufactures	1,982	1,728	West Germany 752; Belgium-Luxembourg 751; Italy 178.
Other metals:			
Ore and concentrates:			
Of silver and platinum group metals.	6	NA	
Other	3,245	4,040	Australia 3,571.
Residues, sweepings, waste, and ashes:			
Of silver and platinum group metals. kilograms	5,535	NA	
Of nonferrous metals, n.e.s	866	790	West Germany 755.
Oxides and hydroxide of barium, magnesium, and strontium.	153	177	United Kingdom 65; West Germany 47.
Metalloids, n.e.s	1,652	2,002	France 851; West Germany 652.
Metals and alloys:			
Alkali, alkaline earth, and rare-earth elements.	182	157	West Germany 155.
Nonferrous, n.e.s	461	700	Mainland China 164; Republic of South Africa, 157; Czechoslovakia 79.
Ferrocerium and other pyrophoricalloys.	10	12	West Germany 7; Austria 3.
Nonmetals:			
Asbestos	14,668	15,772	Canada 11,026; U.S.S.R. 1,695.
Barite and witherite	4,758	3,378	West Germany 2,253.
Boron materials:			
Crude, excluding brine products	443	466	United States 340.
Oxides and acids	487	575	France 290; Italy 279.
Cement	62,005	36,571	France 13,116; Italy 12,423.
Chalk	11,589	11,612	France 11,284.
Clay and clay products:			
Crude	178,990	197,456	West Germany 89,492; United Kingdom 48,971.
Refractory brick and other materials.	26,448	21,766	West Germany 15,230; France 2,142; Austria 1,948.
Nonrefractory products	133,870	131,965	Italy 106,970; West Germany 15,047.
Cryolite and chiolite	157	516	Denmark 516.
Diamond: Industrial, unmounted. thousand carats	1,860	NA	
Diatomite and other infusorial earths	1,593	2,045	United States 726; West Germany 413; Denmark 336.
Dolomite	11,857	13,107	Italy 7,658; France 2,980; Norway 655.
Feldspar, fluorspar, and nepheline syenite.	12,842	14,711	France 5,999; West Germany 3,655; Italy 2,935.
Fertilizer materials:			
Crude:			
Nitrogenous	205	310	West Germany 195.
Organic, including guano and dung.	17,282	20,358	France 19,849.

See footnotes at end of table.

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Table 15.—Switzerland: Imports of mineral commodities—Continued

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Nonmetals—Continued			
Fertilizer materials—Continued			
Crude—Continued			
Phosphatic	37,306	29,359	Morocco 18,365; Belgium-Luxembourg 3,772.
Potassic	105,382	82,005	France 56,937; West Germany 24,386.
Manufactured:			
Nitrogenous	1,029	1,387	West Germany 540; Austria 345; Italy 269.
Phosphatic:			
Basic (Thomas) slag	194,328	194,322	France 126,209.
Superphosphate and others.	12,703	14,827	France 6,814; Netherlands 4,680.
Potassic	12,587	21,409	France 17,137; West Germany 3,553.
Mixed	15,195	19,033	France 10,214; West Germany 6,365.
Ammonia, anhydrous	21,812	13,994	Austria 7,484; West Germany 6,302.
Gem stones, dust thousand carats	1,670	NA	
and powder including diamond dust.			
Graphite	556	626	Austria 380; West Germany 173.
Gypsum and limestone:			
Gypsum and plasters	39,566	56,104	West Germany 28,310; Austria 13,363; Italy 11,185.
Limestone, industrial	70,706	65,048	France 48,951; Italy 15,171.
Lime	9,933	14,124	Italy 13,871.
Magnesite	3,931	4,114	Austria 3,904; West Germany 84.
Mica:			
Crude and partly worked	837	627	West Germany 270; United Kingdom 153.
Worked	162	94	France 73; Belgium-Luxembourg 15.
Pigments, mineral, including iron oxide and hydroxide.	2,083	1,787	West Germany 1,651.
Pumice, emery, corundum, and other natural abrasives.	2,852	3,041	Italy 2,256; West Germany 561.
Salt	1,121	1,121	France 1,030; West Germany 64.
Sodium and potassium compounds, not elsewhere specified:			
Caustic soda	6,071	4,301	France 1,632; West Germany 1,590; Italy 957.
Caustic potash and sodium and potassium peroxides.	3,709	2,874	West Germany 1,206.
Stone, sand and gravel:			
Quartz and quartzite, crude, ground, and roughly squared.	13,865	14,299	Italy 10,531; West Germany 3,139.
Dimension stone, unworked, including slate.	87,096	117,520	Austria 57,337; Italy 28,200; West Germany 16,494.
Gravel and thousand tons	3,110	2,822	France 1,380; West Germany 850; Italy
crushed rock.			568.
Sand, excluding metal do	941	852	Italy 443; Belgium-Luxembourg 148:
bearing.			West Germany 135.
Grinding and polishing stones and wheels.	1,358	1,403	West Germany 688; United Kingdom 177.
Dimension stone, worked, including slate, flagstone, and paving blocks.	19,982	21,833	Italy 13,508; Austria 5,435.
Sulfur and pyrite:			
Sulfur, elemental, crude	81,194	55,287	United States 37,653; France 16,593.
Pyrite, unroasted	48,114	46,314	Italy 46,278.
Sulfur, purified	255	243	West Germany 146.
Sulfur dioxide	612	------	
Sulfuric acid	390	902	West Germany 432; France 422.
Talc, soapstone, and steatite	13,871	12,737	France 5,821; Austria 3,882.
Other nonmetallic materials:			
Bromine, fluorine, and iodine, pure.	1,542	897	France 661.
Slags, dross, scalings, ash, and similar non-metal-bearing metallurgical residues.	92,959	41,582	France 21,301; West Germany 11,390 Italy 8,871.
Mineral substances, n.e.s	24,355	40,427	Italy 22,137; West Germany 13,307.
Mineral fuels:			
Asphalt and bitumen, natural, crude	1,106	862	Trinidad and Tobago 639; United States 185.
Coal, peat, coke, and briquets:			
Coal thousand tons	1,144	888	Italy 316; United States 181; Poland 127.
Coal briquets do	29	23	West Germany 9; France 7; Netherlands 5.
Lignite and lignite briquets do	151	119	West Germany 114.
Peat and peat briquets do	r 30	41	West Germany 37.
Coke do	476	367	West Germany 247; Netherlands 84.
Carbon black	7,671	7,117	France 2,843; West Germany 1,292; Italy 1,143.

See footnotes at end of table.

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Table 15.—Switzerland: Imports of mineral commodities—Continued

Commodity		1965	1966	Principal sources, 1966
Mineral fuels—Continued				
Hydrogen and inert rare gases		58	98	West Germany 39; Norway 18; Canada 17.
Petroleum:				
Crude and partly refined.	thousand tons	1,209	2,353	Algeria 668; Libya 617; U.S.S.R. 582; Bahrain 405.
Refinery products:				
Gasoline	do	1,335	1,341	France 568; Italy 370; West Germany 302.
Kerosine	do	79	73	France 28; Italy 19; Netherlands 14.
Fuel oil:				
Distillate	do	4,050	3,857	France 1,253; Italy 1,005; West Germany 477.
Residual	do	1,181	840	France 348; West Germany 327; Italy 105.
Lubricants	do	71	73	Italy 16; Netherlands 12; United Kingdom 12.
Liquefied petroleum gases.	do	13	13	France 7; Czechoslovakia 3.
Mineral jelly and wax	do	8	7	West Germany 3; United States 2; East Germany 1.
Petroleum coke and pitch coke.	do	55	51	United States 30; West Germany 19.
Bitumen and other residues.	do	233	268	France 124; West Germany 95; Italy 22.
Other	do	20	NA	
Coal, petroleum, and natural gas: Chemicals, not further described.	do	26	21	West Germany 7; France 6; Czechoslovakia 3.

r Revised. NA Not available.
1 Less than ½ unit.
2 Including rolled gold or silver.
3 Including cast iron, sponge iron, spiegeleisen, powder, shot, grit, and pellets.

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The Mineral Industry of Other Areas of Africa

By Henry E. Stipp [1] and Eugene R. Slatick [2]

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Of the 24 countries and territories covered in this chapter, all except Botswana, Ethiopia, Gambia, Guinea, Lesotho, Malawi, Spanish Sahara, and Swaziland are among the overseas associates of the European Economic Community (EEC). Cameroon, Central African Republic, Chad, Congo (Brazzaville), Dahomey, Ivory Coast, Mauritania, Niger, Togo, and Upper Volta are also members of the Communauté Française Afrique (CFA), for which the franc is the standard monetary unit. Where necessary for these countries, CFA francs have been converted to U.S. dollars at the rate of CFAF 245 to 247 = US$1.00. Monetary conversion rates for other countries in this chapter are: Botswana, 1 South African rand = US$1.40; Burundi, 87.5 Burundi francs = US$1.00; Ethiopia, 1 Ethiopian dollar = US$0.40; The French Territory of the Afars and Issas, 214 Djibouti francs = US$1.00; Gambia, 1 Gambian pound (G£) = US $2.80 through December 1967 and 1 G£ = US$2.40 thereafter; Guinea, 246.5 Guinean francs = US$1.00; Lesotho, 1 South African rand = US$1.40 to US$1.41; Malawi, 1 pound = US$2.80 until November 20, 1967, and 1 pound = US$2.40 thereafter; Mali, 245 Mali francs = US $1.00 until May 6, 1967, and 493 Mali francs = US$1.00 thereafter; Rwanda, 100 Rwanda francs = US$1.00; Somali Republic, 1 Somali shilling = US$0.14; Sudan, 1 Sudanese pound = US$2.87; Swaziland, 1 South African rand = US $1.40.

BOTSWANA (FORMERLY BECHUANALAND)

The mineral industry of the Republic of Botswana contributed an insignificant share to the nation's economy in 1967, but recent important mineral deposit discoveries gave hope for increased contribu-

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tions and for possible diversification of the economy that consists mainly of cattle raising. In order to assist mineral industry development, the United Nations Development Program approved a request for a $383,400 preinvestment study of infrastructure required for large-scale development of copper and nickel deposits near Francistown. The Government of Botswana also acted to aid mineral industry development by passing acts to: (1) Vest mineral rights in Tribal Territories in the Central Government of Botswana; (2) give out water rights and provide for the grant of water rights and servitudes; and (3) amend and consolidate laws relating to mines and minerals.

PRODUCTION

Botswana's mineral production continued the sharp decline that began generally in 1965. Manganese output valued at about $49,200 and talc valued at $11,200 were the only minerals of commercial importance produced in 1967. Reportedly the manganese ore was produced from two small mines in southeastern Botswana.

TRADE

Botswana's mineral commodity trade in 1966 was confined to exports of manganese ore valued at $14,036 and asbestos valued at $21,193. These exports came from previously mined stocks. Comparable 1965 figures were manganese ore valued at $44,120 and asbestos valued at $259,535. Mineral commodity imports in 1966 consisted chiefly of iron and steel products valued at $2,625,000 and mineral fuels and lubricants valued at $2,646,000. The principal sources and destination of most mineral commodities in 1966 were the Republic of South Africa and Southern Rhodesia. The relationship of mineral commodity trade to total trade was as follows:

	Value (thousand dollars)		Mineral commodities share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	304	15,939	2.0
1966	35	15,081	.2
Imports:			
1965	NA	23,227	NA
1966	5,914	26,355	22.4
Trade balance:			
1965	NA	−7,288	XX
1966	−5,879	−11,274	XX

NA Not available. XX Not applicable.
[1] Values given are for only those commodities listed in table 2 of this chapter.

Table 1.—Botswana: Production of mineral commodities

Commodity [1]		1963	1964	1965	1966	1967
Metals:						
Gold	troy ounces	142	10	--	--	--
Managanese ore	metric tons	10,775	27,795	8,815	7,000	4,258
Silver	troy ounces	21	1	--	--	--
Nonmetals:						
Asbestos, chrysotile	metric tons	2,148	1,960	806	800	--
Talc	do	--	--	48	--	726

[1] In addition to commodities listed, simple construction materials such as clay and sand and gravel are produced, but quantitative data are not available.

COMMODITY REVIEW

Metals.—*Copper and Nickel.*—Botswana Roan Selection Trust Ltd. (BRST) a subsidiary of Roan Selection Trust Ltd., announced that it would arrange new financing for further exploration of copper and nickel deposits in northern Botswana.[3] Reportedly Bamangwato Concessions Ltd. an affiliate of BRST made much progress in establishing the grade and reserves of copper-nickel ores in the Pikwe-Selibe area and of copper ores in the Matsitamma region.[4] About 29 million tons of copper-nickel minerals containing 1.20 to 1.32 percent copper and 1.50 to 0.66 percent nickel have been proved or are probable at Pikwe-Selibe. In the Matsitamma area 8 million tons of copper ore averaging 2.15 to 2.87 percent copper were proved or indicated. Minor quantities of silver were said to occur in the copper-nickel ore. In order to further investigate the

[3] U.S. Embassay, Gaberones. State Department Airgram A-326, Mar. 14, 1968, p. 1.
[4] Mining Journal (London) Spotlight on Botswana. V. 270, No. 6919, Mar. 29, 1968, p. 236.

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Table 2.—Botswana: Foreign trade in selected mineral commodities

(Exports in metric tons; imports in thousand U.S. dollars)

Commodity	1965 [1]	1966 [2]
Exports:		
Metals: Manganese ore	4,647	874
Nonmetals: Asbestos	1,266	103
Imports:		
Metals:		
Iron and steel semi-manufactures	NA	2,625
Nonferrous, including articles thereof (copper, nickel, aluminum, zinc, and tin)	NA	347
Nonmetals:		
Asbestos sheets	NA	40
Bricks and tiles	NA	45
Cement	NA	120
Fertilizers	NA	16
Salt	NA	75
Mineral fuels:		
Coal and coke	NA	22
Petroleum	NA	970
Diesel	NA	990
Paraffin oil	NA	124
Lubricating oil	NA	160
Other	NA	380
Total	2,458	2,646

NA Not available.
[1] Standard Bank Review (London) October 1966, p. 20.
[2] Republic of Botswana (Gaberones) Statistical Abstract, 1967, p. 47–51.

potential of the deposits, BRST was building a pilot plant at Shashi.[5] It was estimated that between $76 to $111 million would be required to develop the deposits and additional financing would be needed to provide water, power, and transportation facilities.[6]

Nonmetals.—*Diamond.*—A number of kimberlite pipes were discovered about 190 kilometers west of Francistown (near Letlhakane)[7] by Kimberlitic Searches Ltd., a subsidiary of DeBeers Consolidated Mines Ltd. A report issued by DeBeers confirmed that one of the larger pipes contained some diamonds in the top 20 feet. A drilling survey will be required to assess the significance of the discovery. At year-end the Government of Botswana and Anglo-American Corp. were studying the construction of a road from Serowe to Letlhakane to provide passage for heavy mining machinery and supplies needed to investigate mineral deposits at Letlhakane.[8]

Mineral Fuels.—*Petroleum and Natural Gas.*—The Alpha Exploration Co. Ltd. of Canada was scheduled to receive a government grant for petroleum and natural gas exploration in the Kgalagadi District.[9] Bechuanaland Oil Exploration Ltd. and Kalahari Oil Exploration Ltd. of Canada also were given state grants to explore an area of crown lands in the north and in the western Kalahari, respectively.

BURUNDI

The minerals industry of Burundi was restricted to a small output of tin and rare earth minerals although deposits of iron and bauxite reportedly occur in the nation. The value of minerals production was of little importance to the economy. Prospecting and geological surveys being undertaken by the European Development Fund and the United Nations Committee for Development Planning gave some hope for the future. The enactment of a liberal investment code in August 1967 could stimulate development of mineral deposits.

PRODUCTION

Official statistical data on minerals production were not available, but unofficial reports indicated that Société Minetain increased output of cassiterite 91 percent compared with that of 1966. Production of bastnaesite, a rare-earth mineral, increased 50 percent compared with 1966 output.

TRADE

Burundi's trade in commodities (except for diamonds that originated outside of Burundi and were reexported) was nonexistent in 1965. Trade in mineral commodities during 1966 increased somewhat; however, it still constituted a small percentage

[5] The Standard Bank Review (Johannesburg). No. 577, April 1967, p. 22.
[6] Work cited in footnote 4.
[7] Standard Bank Review (London). June 1968, p. 23.
[8] The Standard Bank Review (Johannesburg). No. 583, October 1967, p. 24.
[9] Standard Bank Review (London). March 1967, p. 23.

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of total trade as shown in the following tabulation:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports and Reexports:			
1965	5,667	6,083	93
1966	680	3,383	20
Imports:			
1965	-------	2,874	-----
1966	381	9,650	4
Trade balance:			
1965	+5,667	+3,209	XX
1966	+299	−6,267	XX

XX Not applicable.
[1] Includes only those commodities listed in table 4 of this chapter.

Table 3.—Burundi: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]		1963	1964	1965	1966	1967
Metals:						
Columbium-tantalum concentrate		2	NA	NA	NA	NA
Rare earth concentrate (bastnaesite)		---	-----	r 150	200	300
Tin:						
Cassiterite concentrate	long tons	25	22	17	49	94
Content of concentrate	do	16	NA	10	NA	NA
Nonmetals: Limestone		360	120	150	NA	NA

r Revised. NA Not available.
[1] In addition to commodities listed construction materials such as clay and sand and gravel are produced, but quantitative data are not available.

Table 4.—Burundi: Foreign trade in selected mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations or sources, 1966
Exports:			
Metals:			
Copper and alloys, unwrought	------	50	All to Italy.
Nonmetals:			
Diamond, Nonindustrial value, thousands	$5,667	$460	All to United Kingdom.
Fertilizer materials:			
Phosphatic	------	2,200	All to Italy.
Others	------	120	All to West Germany.
Imports:			
Metals:			
Iron and steel	------	1,451	All from Belgium-Luxembourg.
Nonmetals:			
Pigments	------	41	Do.
Mineral fuels:			
Petroleum products: Lubricants and greases.	------	213	Do.

NA. Not available.
[1] Statistical Office of the United Nations. Supplement to the World Trade Annual, V. 3, 1965 and V. 3, 1966.

CAMEROON

The mineral industry of the Federal Republic of Cameroon consisted essentially of producing and fabricating aluminum and mining minor quantities of gold and

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tin minerals. About 3 percent of the estimated 1967 gross national product of $715 million was attributed to mineral production. Significant events in the minerals sphere were inauguration of a new aluminum rolling mill at Edea and construction of a dam and hydroelectric facilities to supply the aluminum industry with power. Three petroleum companies were conducting exploration. Indications of oil and gas were reported, but there has been no commerical exploitation. The Bureau de Recherches Géologiques et Minières (BRGM) was conducting several geological studies in 1967. These included investigation of water in the Mount Mandara area, study of basic rocks of eastern Cameroon and their associated metals, investigations of magnetic anomalies near Poli, tectonic studies in central Cameroon, studies of sapphire reserves in the Mamjé region, and examination of a corundum deposit in the Nsanarakaty river.[10]

PRODUCTION

Aluminum output declined during 1966 and 1967 from 1965 because of a decrease in electric power production on the Sanaga River. Construction of a new dam and power facilities at Mbakaou will ensure Compagnie Camerounaise d' Aluminium Péchiney-Ugine (ALUCAM) of a steady source of power and will allow an increase in aluminum production. Cameroon's second 5-year plan projects an increase to 58,000 tons per year by 1971. Although gold output increased from the 1966 level, the outlook for a substantial rise in future production was not encouraging because of depleted ore reserves. Tin ore production during the last 5 years has been much lower than in previous years.

TRADE

Exported aluminum ingot, valued at $20.4 million in 1966, was the principal mineral commodity foreign exchange earner. Principal mineral commodity imports in 1966 were petroleum refinery products ($7 million), alumina, (almost $4 million), and iron and steel products (more than $6 million). The relationship between mineral and total trade during 1965 and 1966 was as follows:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	20.7	140.1	15
1966	21.1	146.2	14
Imports:			
1965	28.1	152.7	18
1966	25.1	147.4	17
Trade balance:			
1965	−7.4	−12.6	XX
1966	−4.0	−1.2	XX

XX Not applicable.
[1] Includes only those commodities listed in tables 6 and 7 of this chapter.

COMMODITY REVIEW

Metals. — *Aluminum.* — An Aluminum rolling mill owned by Société Camerounaise de Transformation de l'Aluminum (SOCATRAL) was constructed near the aluminum smelter at Edea.[11] The plant was scheduled to manufacture 7,500 tons of aluminum roofing and semifinished corrugated aluminum sheeting from aluminum ingot produced by the ALUCAM smelter. The European Investment Bank granted a $4 million loan to Société d-Energie Electrique du Cameroun (ENELCAM) for construction of a dam and reservoir on the Sanaga River at Mbakaou and for installation of an additional powerplant

[10] Mines et Métallurgie (Paris). L'activité Minière et Métallurgique au Cameroun en 1967. No. 6, June–July 1968, p. 182.
[11] U.S. Embassy, Yaounde, Department of State Airgram A–148, Feb. 28, 1968, pp. 1, 3.

Table 5.—Cameroon: Production of mineral commodities

Commodity [1]		1963	1964	1965	1966	1967
Metals:						
Aluminum	metric tons	52,913	51,507	50,487	48,159	48,324
Gold	troy ounces	1,865	739	1,286	r 675	991
Tin, content of concentrate	long tons	25	40	40	25	51

r Revised.
[1] In addition to commodities listed, construction materials such as clay and sand and gravel are produced, but quantitative data are not available.

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Table 6.—Camaroon: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal destinations, 1966
Metals: [3]			
Aluminum, mainly ingot	46,547	46,581	France 23,736; United States 10,336; Belgium-Luxembourg 5,317.
Iron and steel:			
Scrap	2	NA	
Semimanufactures	79	244	Gabon 188; Nigeria 32.
Lead	60	31	Belgium-Luxembourg 20; Italy 11.
Nonferrous ore and concentrates, n.e.s	148	33	All to Spain.
Nonmetals:			
Cement, lime and other building materials.	------	14	Chad 3.
Clay construction materials	3	9	Central African Republic 4; Chad 3; Congo (Brazzaville) 2.
Nonmetallic minerals, crude, n.e.s	40	93	Chad 47; Nigeria 45.
Mineral fuels:			
Petroleum refinery products	868	77	Congo (Brazzaville) 42; Gabon 27.

NA Not available.
[1] Statistical Office of the European Communities. No. 2, 1967, pp. 73–94.
[2] Statistical Office of the European Communities. No. 4, 1968, pp. 63–79.
[3] Includes unwrought and semimanufactures unless otherwise specified.

Table 7.—Cameroon: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal sources, 1966
Metals: [3]			
Aluminum:			
Alumina	86,143	45,528	Guinea 39,275; France 3,441; Italy 1,000.
Metal	2,736	4,293	Belgium-Luxembourg 3,891; France 364.
Copper	70	40	France 39.
Iron and steel:			
Pig iron and ferroalloys	273	225	All from France.
Steel ingots and equivalent forms	329	329	All from France.
Semimanufactures:			
Bars, rods and sections	11,159	12,154	France 8,171; Belgium-Luxembourg 2,324.
Plate, sheet and strip	9,811	7,556	France 5,965; West Germany 646.
Rails and accessories	9,940	15,224	France 14,616; Italy 495.
Wire	619	1,210	France 1,090.
Tubes, pipes and fittings	3,329	1,989	France 1,671; Belgium-Luxembourg 165.
Total	34,858	38,133	
Lead	22	21	France 20.
Tin—long tons	3	1	France 1.
Zinc	11	6	France 6.
Nonmetals:			
Abrasive, natural	149	157	France 155.
Cement, lime and other building materials.	117,431	100,860	France 50,282; Belgium-Luxembourg 26,458; United Arab Republic 7,983.
Clay construction materials	1,373	2,441	France 1,934; West Germany 343.
Fertilizer materials: Manufactured	32,221	14,779	France 8,528; West Germany 3,015; Italy 2,009.
Stone, sand and gravel	187	1,268	France 1,126; Morocco 100.
Nonmetallic minerals, crude, n.e.s	18,154	11,190	West Germany 6,456; Spain 1,369; Poland 1,151.
Nonmetallic mineral manufactures, ne.s	129	155	France 114; Hong Kong 32.
Mineral fuels:			
Coal, coke and briquets	448	464	France 464.
Gas, natural and manufactured	1,056	839	France 400; Ivory Coast 346.
Petroleum:			
Refinery products	153,815	166,685	Curacao 49,998; Italy 26,254; Algeria 23,000.
Tar, pitch and other crude chemicals from coal, oil and gas and gas distillation.	[4] 1,318	505	United Kingdom 501.

[1] Statistical Office of the European Communities. No. 2, 1967, pp. 73–94.
[2] Statistical Office of the European Communities. No. 4, 1968, pp. 63–79.
[3] Includes unwrought and semimanufactures, unless otherwise specified.
[4] Included with petroleum refinery products.

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at Edea. ENELCAM supplies electrical power to the aluminum complex.

Nonmetals.—*Cement.*—Société d'Etudes de la Cimenterie du Nord Cameroon (CIMENCAM) planned to construct a cement plant at Figuil, northern Cameroon.[12] The plant will obtain limestone from a local deposit of 600,000 tons and from extensive deposits at Bidzar, 20 kilometers away. Numerous kaolin deposits in the vicinity will also be used. CIMENCAM also was scheduled to build a clinker grinding plant at Douala to produce 110,000 tons of cement per year.

Mineral Fuels.—*Petroleum.*— Société d'Etudes et de Recherches des Petroles du Cameroun (SEREPCA) investigated a 4,870-square-kilometer offshore area and a 5,540-square-kilometer area onshore.[13] Mobil Exploration Equatorial Africa was granted an exploration permit covering 3,150 square kilometers offshore near the Cameroon-Nigeria border. During 1967 the company conducted seismic surveys which confirmed the presence of two structural anomalies. Gulf Oil Co. of Cameroon was granted a prospecting permit on 5,759 square kilometers inland.

CENTRAL AFRICAN REPUBLIC

The only significant mineral commodity mined during 1967 was diamond, the value of which was equal to about 12 percent of the estimated gross national product of $126 million. A negligible quantity of gold was recovered as a byproduct of diamond mining. Uranium prospecting was centered at Bakouma, 600 kilometers east of Banqui.

PRODUCTION

Diamond production decreased 3.6 percent from that of 1966, chiefly owing to lower recovery by mining companies. The share of diamond mined by small groups of Africans and individuals increased from 86 percent in 1966 to 91 percent in 1967, with the mining companies accounting for the remainder.[14]

TRADE

Mineral exports, chiefly diamond, rose 14 percent in value, from $14.4 million in 1965 to $16.5 in 1966. Exports of all commodities to areas outside the Central African Economic and Customs Union increased from $26.4 million in 1965 to $30.8 million in 1966.

Imports of mineral commodities decreased in value from $3.6 million in 1965 to $3.1 million in 1966. Principal mineral commodity imports were petroleum refinery products ($1.7 million), iron and steel products ($0.5 million), and cement, lime, and building materials (about $0.5 million). Imports of all commodities increased 12 percent to $30.7 million compared with $27.4 million in 1965.

COMMODITY REVIEW

Metals.—*Uranium.*—The French Atomic Energy Commission was investigating a deposit at Bakouma, 600 kilometers east of Bangui.[15] Exploitation of the deposit was expected to start in 1968 and to continue for about 20 years. Annual production was scheduled at 100,000 tons of ore equivalent to 300 tons of uranium metal. Two hundred persons were employed at the operation including 24 technical personnel. A French and Central African Republic agreement was negotiated for construction of a chemical leaching plant near Bakouma.[16] An industrial complex costing about $10 million was planned.

[12] U.S. Embassy, Yaounde. Department of State Airgram A-122, Dec. 28, 1967, p. 1.
[13] Mining Annual Review (London). May 1968, p. 324.
[14] Mining Journal (London). V. 270, No. 6920, Apr. 5, 1968, p. 265.
[15] International Financial News Survey. V. 20, No. 1, Jan. 12, 1968, p. 8.
[16] Mineral Trade Notes. V. 65, No. 4, Apr. 1968, pp. 35, 36.

Table 8.—Central African Republic: Production of mineral commodities

Commodity [1]	1963	1964	1965	1966	1967
Metals: Gold—troy ounces	96	75	23	48	----
Nonmetals: Diamond—carats	402,364	442,281	536,810	539,935	520,628

[1] In addition, construction materials such as clay and sand and gravel were probably produced, but quantitative data was not available.

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Table 9.—Central African Republic: Foreign trade in selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal sources or destinations, 1966
Exports:			
Nonmetals: Diamond---carats	509,545	552,451	Israel 203,302; United States 193,358; United Kingdom 69,609.
Mineral fuels: Petroleum refinery products.	1,267	304	Ship's stores.
Imports:			
Metals:			
Aluminum	291	148	France 147.
Copper	10	5	France 5.
Iron and steel:			
Pig iron and ferroalloys	3	3	France 3.
Semimanufactures	3,500	2,725	France 2,315; Belgium-Luxembourg 338.
Lead	5	2	France 1; Netherlands 1.
Tin---long tons	(3)	1	France 1.
Zinc	1	---	
Nonmetals:			
Abrasives, natural	20	45	France 45.
Cement, lime, and other building materials.	15,753	18,402	Congo (Kinshasa) 10,174; France 6,236; West Germany 1,970.
Clay construction materials	96	118	France 64; West Germany 42.
Fertilizer materials: Manufactured	2,377	1,201	West Germany 728; France 473.
Nonmetallic mineral manufactures	28	156	France 153.
Other crude minerals	2,571	5,561	Portuguese Guinea 4,854; Portugal 492.
Mineral fuels:			
Gas, natural or manufactured	264	270	France 210; Ivory Coast 59.
Petroleum refinery products	35,706	32,032	Venezuela 13,297; Curacao 12,994; Spain 2,193.
Tar, pitch, and other crude chemicals from coal, oil and gas distillation.	10	7	France 7.

[1] Statistical Office of European Communities. No. 7, 1966.
[2] Statistical Office of European Communities. No. 6, 1967.
[3] Less than ½ unit.

A 350-kilometer road to connect Bakouma with Mobaye also was envisaged.

Nonmetals.—*Diamond.*—European-controlled companies carried out exploration along the Lobaye river seeking deposits of sufficient size to permit the use of large dredges to recover diamond,[17] but through yearend only small deposits had been discovered.

CHAD

The mineral output of Chad was limited to the recovery of natron, salt, rhyolite and limonite near Hadjer el-Bigli, granite near Fort Archambault, and gravel near Bongar. Some natron was exported, the other commodities were consumed locally. Deposits of columbite, tin, and tungsten occur in the Tibesti region but were not being mined in 1967. Noncommercial quantities of crude oil reportedly occur in the Tibesti mountains and in the vicinity of Tekro. Mining of natron for export, the only mineral activity upon which a value could be placed, contributed 0.2 percent to the gross domestic product estimated at $254 million.

PRODUCTION AND TRADE

Natron valued at about $453,000 was the only mineral of commercial significance in Chad. Small quantities of salt, rhyolite, limonite, granite, clay, and sand and gravel were mined, but except for salt the quantities produced were not recorded.

Chad's trade in mineral commodities consisted principally of natron exports valued at $176,000 in 1966 compared with 1965 exports valued at $256,000. Principal mineral commodity imports have been petroleum refinery products ($4.4 million in 1966 compared with $6.3 million in 1965);

[17] Mining Journal (London). V. 270, No. 6920, Apr. 5. 1968, p. 265.

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iron and steel semimanufactures ($857,000 in 1966, compared with $822,000 in 1965); and cement, lime, and building materials ($545,000 in 1966 compared with $598,000 in 1965). Petroleum refinery product reexports in 1966 were valued at $151,000 as compared with similar reexports valued at $963,000 in 1965.

Exports of all commodities totaled $23.7 million in 1966, compared with $27.2 million in 1965, while all commodity imports were valued at $29.7 million in 1966 and $31.1 million in 1965. These total trade values exclude trade with other UDEAC countries, which was considered substantial.

COMMODITY REVIEW [18]

Nonmetals.—Studies were made of the Maya-Kebbi limestone deposits to determine if they were suitable for lime manufacture. It was concluded that these deposits were too small, widely scattered, and of low quality for large-scale exploitation.

[18] United Nations. Report of the ECA Mission on Economic Cooperation in Central Africa. 1966, p. 38.

Table 10.—Chad: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Natron	25,000	6,757	7,100	6,500	8,600
Salt and natron	NA	NA	NA	NA	8,000

NA Not available.

Table 11.—Chad: Foreign trade in selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal sources or destinations, 1966
Exports:			
Metals:			
Scrap nonferrous	52	--------	
Nonmetals: Natron	6,271	3,985	All to Nigeria.
Mineral fuels:			
Petroleum refinery products	5,723	3,339	Ships' stores 3,339.
Imports:			
Metals: [3]			
Aluminum	59	5	All from France.
Copper	8	6	Do.
Iron and Steel:			
Pig iron and ferroalloys	4	5	Do.
Semimanufactures	2,802	3,002	France 2,326; Belgium-Luxembourg 412; West Germany 202.
Lead	6	5	All from France.
Zinc	------	1	Do.
Nonmetals:			
Abrasives, natural	4	4	Netherlands 3.
Cement, lime, and other building materials.	6,802	7,896	France 4,034; West Germany 3,668.
Clay construction materials	68	129	France 62; West Germany 50; Italy 17.
Fertilizers, manufactured	489	1,185	France 1,185.
Nonmetallic minerals, crude, n.e.s.	3,746	3,112	East Germany 992; Portuguese Guinea 909.
Nonmetallic mineral manufactures	37	31	France 24; West Germany 3.
Mineral fuels:			
Gas, natural or manufactured	175	146	United States 83; France 50.
Petroleum refinery products	39,689	29,534	Curacao 13,145; United States 8,021; Nigeria 2,299.

[1] Source: Statistical Office of the European Communities. No. 7, 1966, pp. 84–101.
[2] Source: Statistical Office of the European Communities. No. 6, 1967. pp. 83–93.
[3] Includes unwrought and semimanufactures, unless otherwise specified.

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CONGO (BRAZZAVILLE)

The mineral industry of Congo (Brazzaville) contributed only about $1.5 million to the gross domestic product estimated at $174 million. The foremost products were crude petroleum, lead-zinc-copper ore, cassiterite, and gold.

Significant developments in the industry included discovery of a high-grade iron ore deposit estimated to contain over 400 million tons, completion of the nation's first cement plant, continued progress on the potash mine at Saint Paul and on ancillary facilities.

Research was being conducted by the Congolese Mining Bureau on diamond discoveries north of Yaya, on lead sulfide mineralization in the Kouilou district, and on chromite indications in the Chaillu Mountains. Soviet technicians were evaluating gold and diamond occurrences in the Mayombe plateau and the Chaillu Mountains.

PRODUCTION AND TRADE

Data on production of mineral commodities were not available for 1967; it was estimated that copper output increased somewhat compared with that of 1966, while lead and zinc ore output reportedly was less than in 1966 because of lower world market prices. Tin output apparently was about the same as in 1966. A small quantity of limestone was probably produced for the cement plant, scheduled to begin operating in early 1968. Crude petroleum production was down about 12 percent below that of 1966 because of continuing depletion of the limited reserves at the Point Indienne field.

Exports of diamond, which entered the country through illicit channels, continued to represent the principal source of foreign exchange from mineral commodities. Although value from this source was less than in 1965, it contributed substantially to the nation's favorable balance of trade in minerals and sizably reduced its overall unfavorable balance as shown in the following tabulation:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	22,032	46,804	47.1
1966	17,204	43,181	39.8
Imports:			
1965	r 8,978	r 64,709	13.9
1966	8,977	69,563	12.9
Trade balance:			
1965	+13,054	−17,905	XX
1966	+8,227	−26,382	XX

XX Not applicable. r Revised.
[1] Includes only those commodities in tables 13 and 14 of this chapter.

In addition to diamond, other important mineral commodities exported in 1966 were crude oil ($862,000) and nonferrous ore and concentrates ($730,000).

Principal mineral commodities imported in 1966 included petroleum refinery products ($4,108,000), iron and steel semimanufactures ($2,557,000) and cement, lime, and other building materials– ($958,000).

Table 12.—Republic of Congo (Brazzaville): Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals: [2]					
Copper	r 831	NA	68	356	e 400
Gold—troy ounces	r 570	r 1,102	r 2,727	4,080	NA
Lead	330	2,169	e 2,800	2,648	e 2,200
Tin—long tons	43	34	44	48	[3] 48
Zinc	713	5,060	6,900	6,178	e 6,000
Nonmetals:					
Limestone	-------	----------	----------	----------	e 5,000
Mineral fuels:					
Petroleum, crude	109,217	82,506	70,987	61,922	e 54,300

e Estimated. r Revised.
[1] In addition construction materials such as clay and sand and gravel are probably produced, but quantitative data are not available.
[2] Metal content of marketable ore or concentrate produced, except for gold which is in the form of fine metal recovered in mining.
[3] The Statistical Bulletin of the International Tin Council. V. 12, No. 5, May 1968, p. 9.

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Table 13.—Republic of Congo (Brazzaville): Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal destinations, 1966
Metals:			
Iron and steel:			
Scrap	1,016	968	All to Italy.
Semimanufactures	9	4	All to France.
Lead	5	6	All to Italy.
Zinc	3	--	
Nonferrous ore and concentrate	16,687	12,721	United Kingdom 7,173; West Germany 5,508.
Nonferrous scrap	43	103	Ivory Coast 52; West Germany 32.
Nonmetals:			
Diamond, gem—value, thousands	$19,957	$15,170	Netherlands $7,391; United Kingdom $7,268.
Mineral fuels:			
Petroleum:			
Crude	71,001	65,182	France 56,150; Belgium-Luxembourg 9.032.
Refinery products	7,253	11,103	Ships' stores.
Minerals, crude, unspecified	11	150	All to ships' stores.

[1] Statistical Office of the European Communities. No. 7, 1966, pp. 149–170.
[2] Statistical Office of the European Communities. No. 6, 1967, pp. 59–73.

Table 14.—Republic of Congo (Brazzaville): Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal sources, 1966
Metals:			
Aluminum	263	221	France 215.
Copper	57	30	France 28.
Iron and steel:			
Pig iron and ferroalloys	10	100	France 100.
Semimanufactures:			
Bars, rods, and sections	3,827	4,908	France 2,493; West Germany 959; Italy 750.
Plate, sheet and strip and hoop	5,539	4,188	France 2,098; Belgium-Luxembourg 1,419.
Rails and accessories	3,513	884	France 876.
Tubes, pipes and fittings	2,262	1,289	France 1,016; U.S.S.R. 128.
Other	63	97	France 80; U.S.S.R. 9; West Germany 7.
Total	15,204	11,366	
Lead	18	10	France 9; West Germany 1.
Tin—long tons	6	4	France 4.
Zinc	7	10	France 10.
Nonmetals:			
Abrasives, natural	133	26	France 26.
Cement, lime, and building materials	44,060	44,392	U.S.S.R. 31,634; France 8,362; Belgium-Luxembourg 2,028.
Clay construction materials	251	331	West Germany 175; France 148.
Fertilizer materials:			
Natural	722	2,295	France 2,295.
Manufactured	5,522	7,067	France 6,761.
Stone, sand and gravel	37	212	Italy 111; France 20.
Sulfur and pyrite	160	135	France 135.
Nonmetallic minerals, crude, unspecified	2,269	3,375	Senegal 1,983; United Arab Republic 1,000; France 266.
Nonmetallic mineral manufactures	116	82	France 62; West Germany 7.
Mineral fuels:			
Coal, coke and briquets	187	123	France 123.
Petroleum refinery products	89,569	111,406	Curacao 36,981; Italy 25,698; Iran 11,264; Venezuela 10,911.
Gas, natural and manufactured	616	605	France 314; Ivory Coast 281.
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation.	3	6	France 6.

[1] Statistical Office of the European Communities. No. 7, 1966. pp. 149–170.
[2] Statistical Office of the European Communities. No. 6, 1967. pp. 59–73.

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COMMODITY REVIEW

Metals.—*Copper.*—The Société de M'Passa (S.M.P.) intensified research on methods of separating copper minerals from lead-zinc-copper ore mined in the Pool district, southwest of Mindouli.[19]

Gold.—Crude gold was recovered by panning and with the help of small tables at Dimonika and Kakamocka in the Kouilou district and at Kelle and M'Boma in the Equator district.[20] Some was purchased by local jewelery makers, and the remainder was cast into ingots and stored at the treasury.

Iron Ore.—At yearend 1966 a deposit was discovered in Zanaga that reportedly contained over 400 million tons of high-grade ore.[21] Technicians from the European Economic Community were prospecting the deposit located 198 kilometers from the Gabon border and 200 kilometers northwest of Brazzaville.

Lead and Zinc.—Reserves of the S.M.P. deposit southwest of Mindouli at yearend 1966 was 4,000 tons of proved ore and 7,000 tons of probable ore containing 50 percent mixed lead and zinc and 42 to 46 percent copper.

Tin.—Compagnie Métallurgique et Minière produced cassiterite from Moufaumbi River gravels in the district of Madingo-Kayes.[22] The company proposed to double production by exploiting large surface areas and installing a plant to concentrate tin minerals containing wolframite.

Nonmetals.—*Cement.*—At the close of 1967 a cement plant in the Loutété region, 149 kilometers west of Brazzaville was nearing completion and was to begin operating in March 1968.[23] Annual production of 80,000 tons of cement will be utilized partly by domestic consumers (50,000 tons) and partly by other countries of the UDEAC customs union. Limestone deposits in the Loutété region were estimated at 700 million tons.

Potash.—Development of the deposit at Saint Paul about 45 kilometers northeast of Pointe-Noire continued. Mining was planned to start on a 3-meter thick sylvinite bed containing 35 percent (K_2O) at a depth of about 300 meters.[24] This bed extends over an area of about 900 hectares. Two other beds 2 meters thick, lying at a depth of about 290 meters contain 20 percent K_2O, and these beds cover an area of about 2,000 hectares. Reserves were estimated at 35 million tons of K_2O equivalent. The World Bank and the European Investment Bank granted loans totaling $39 million to the Compagnie des Potasses du Congo (CPC) for development of the mine and associated projects.[25] The project calls for mining 500,000 tons per year of potash, refining the crude ore to commercial grade potassium chloride, and transportation of the product to the terminal near Pointe Noire for export. Mine production was scheduled to begin in early 1969. A new wharf capable of handling ships of 65,000-ton capacity and a short railroad spur line will be constructed as part of the project.

DAHOMEY

In 1967, as in the past several years, there was no recorded mineral production in the Republic of Dahomey. Mineral prospecting continued, but no discoveries were reported. Geophysical surveys made in conjunction with oil exploration have indicated the presence of a coastal basin containing about 13,000 feet of sediments. Dahomey's 1967 gross national product, was estimated at $175 million.

TRADE

Dahomey's trade pattern in 1966 was similar to that in previous years. Iron and steel scrap was the major mineral commodity export (value $23,000); reexports of petroleum refinery products were valued at $20,000. Principal mineral commodity imports were petroleum refinery products ($1,452,000), iron and steel semimanufactures ($1,289,000), and cement,

[19] Industries et Travaux d'Outremer (Paris). No. 165, August 1967, p. 753.
[20] Work cited in footnote 19.
[21] International Financial News Survey. V. 18, No. 51, Dec. 23, 1966, p. 433.
[22] Work cited in footnote 19.
[23] International Financial News Survey. V. 20, No. 15, Apr. 19, 1968, p. 126.
[24] Mining Magazine. Exploitation of Congolese Potash Deposits. V. 118, No. 2, Feb. 1968, pp. 126, 127, 129.
[25] International Bank for Reconstruction and Development. Press Release No. 67/1, Jan. 9, 1967, p. 1.

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lime, and other building materials ($1,142,000). The country's trade balance continued to be unfavorable, but there was an improvement in the 1966 balance for mineral commodities as shown in the following tabulation:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	44	13,639	0.3
1966	72	10,473	.7
Imports:			
1965	5,642	34,395	16.4
1966	4,623	33,473	13.8
Trade balance:			
1965	−5,598	−20,756	XX
1966	−4,551	−23,000	XX

XX Not applicable.
[1] Values given are for only those commodities listed in tables 15 and 16 of this chapter.

COMMODITY REVIEW

Nonmetals.—*Cement.*—In June the Government signed an agreement with French private interests to form a new company, Société des Ciments du Dahomey (SCD), in which the Government would have a 25-percent initial share and an option to increase its share to 50 percent. SCD is to build a 100,000-ton-per-year plant at Cotonou to make cement from imported clinker. Previous plans to build a cement plant near the limestone deposits at Pobe have been abandoned as uneconomical.

The Governments of Dahomey and Togo and French private interests have agreed to jointly study the limestone deposits at Toffo, near Alloda, in Dahomey, and at Aveta in Togo, to determine which of the deposits will be more feasible to develop. Clinker made from the selected deposit will then be used in the Cotonou plant.

Dahomey's cement industry will be further developed through a special fund supported by a $0.80-per-ton tax on imported cement which is expected to provide $120,000 per year.

Mineral fuels.—*Petroleum.*—Late in the year, Union Oil Co. of Dahomey, a wholly owned subsidiary of Union Oil Co. of California, began drilling the first exploratory oil well in the country. The well, in 90 feet of water and 13 kilometers offshore, is about 29 kilometers southeast of Cotonou. The nearest commercial oil production is about 240 kilometers away in Nigeria. Union Oil acquired its 3.7-million-acre concession in 1964.

Table 15.—Dahomey: Exports of selected mineral commodities

(Metric tons)

Commodity	1965 [1]	1966 [2]	Principal destinations, 1966
Metals:			
Aluminum	-----	15	Ivory Coast 12; Togo 2.
Iron and steel:			
Scrap	r 2,002	1,160	Italy 1,160.
Semimanufactures	294	20	France 8; Central African Economic and Customs Union 8.
Lead	r 3	7	NA.
Nonferrous metals, n.e.s	r 7	23	France 10; Belgium-Luxembourg 10.
Nonmetals:			
Cement, lime and other building materials.	27	11	Togo 8; Nigeria 3.
Clay construction materials	10	10	Ivory Coast 8.
Fertilizers, manufactured	r 25	-------	
Nonmetallic minerals, crude, unspecified	15	64	Niger 53.
Nonmetallic mineral manufactures	16	30	Nigeria 30.
Mineral fuels:			
Gas, natural and manufactured	13	2	Togo 2.
Petroleum refinery products	246	81	Togo 56; Nigeria 12; Niger 9.

r Revised. NA Not available.
[1] Statistical Office of the European Communities. No. 1, 1967, pp. 29–46.
[2] Statistical Office of the European Communities. No. 8, 1967, pp. 150–162.

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Table 16.—Dahomey: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal sources, 1966
Metals: [3]			
Aluminum	79	34	France 33.
Copper	65	6	France 6.
Iron and steel:			
Pig iron and ferroalloys	49	--------	
Steel ingots and equivalent forms	7	--------	
Semimanufactures:			
Bars, rods, and sections	3,128	1,981	France 1,591; Belgium-Luxembourg 254.
Plate, sheet and strip	3,532	3,122	Belgium-Luxembourg 2,579; France 531.
Other	1,201	703	France 594; West Germany 52.
Total	7,861	5,806	
Lead	20	13	France 6; West Germany 5; Belgium-Luxembourg 2.
Tin long tons	2	1	France 1.
Zinc	3	--------	
Nonmetals:			
Abrasives, natural	11	3	France 3.
Cement, lime, and other building materials.	59,720	57,220	France 11,927; Poland 10,422.
Clay construction materials	688	564	France 454; West Germany 73.
Fertilizers, manufactured	1,932	2,786	France 2,110; Belgium-Luxembourg 508.
Stone, sand and gravel	409	18	France 9.
Sulfur and pyrite	11	14	France 14.
Nonmetallic minerals, crude, unspecified	9,740	8,993	Senegal 7,209; United Kingdom 611.
Nonmetallic mineral manufactures	22	25	France 18; Nigeria 7.
Mineral fuels:			
Coal, coke and briquets	------	2	France 2.
Gas, nautral and manufactured	271	236	Spain 109; France 44; Nigeria 38.
Petroleum refinery products	51,251	39,658	Venezuela 12,729; Iraq 10,591; Italy 6,697.
Tar, pitch, and other crude chemicals	47	26	United Kingdom 20; France 6.

[1] Statistical Office of the European Communities. No. 1, 1967, pp. 29–46.
[2] Statistical Office of the European Communities. No. 8, 1967, pp. 150–162.
[3] Includes unwrought and semimanufactures unless otherwise specified.

ETHIOPIA

The mineral industry continued to play a minor role in Ethiopia's economy, although a new petroleum refinery will help reduce foreign exchange expenditures. The mineral industry's contribution to the GNP, estimated at $1.6 billion in 1967, was less than 1 percent. Petroleum exploration continued (four companies had concessions), but no oil was found. To encourage mineral prospecting, the Government recently published a compendium of Ethiopia's mineral resources.[26]

PRODUCTION AND TRADE

In general, mineral production in 1967 declined slightly as compared with that of 1966. In 1967, a production figure for limestone was available for the first time in several years.

Salt continued to be the major mineral commodity export with a value of $485,000 in 1966 as compared with $270,000 in 1965. Principal mineral commodity imports in 1966 were petroleum refinery products valued at $10.6 million ($9.4 million in 1965) and iron and steel semimanufactures valued at $6.3 million ($2 million in 1965). As shown in the following tabulation, Ethiopia's balance of trade continued to be unfavorable in both mineral commodities and total trade:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	0.4	r 113.2	r 0.4
1966	.5	107.6	.5
Imports:			
1965	17.5	r 150.3	r 11.6
1966	18.9	161.7	11.7
Trade balance:			
1965	−17.1	r −37.1	XX
1966	−18.4	−54.1	XX

r Revised. XX Not applicable.
[1] Values given are for only those commodities listed in table 18 of this chapter.

[26] Jelene, Danilo A. Mineral Occurrences of Ethiopia. Ministry of Mines, Addis Ababa, 1966, 720 pp.

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Table 17.—Ethiopia: Production of mineral commodities [1]

(Metric tons unless otherwise specified)

Commodity [2]	1963	1964	1965	1966	1967
Metals:					
Gold—troy ounces	e 27,300	e 27,300	24,236	4 21,256	e 21,000
Manganese ore, shipments	3 3,496	3 3,248	NA	NA	NA
Platinum, placer—troy ounces	e 180	e 180	353	r 318	282
Nonmetals:					
Cement—thousand tons	34	44	96	r 165	150
Feldspar	e 500	e 10,000	NA	1,550	------
Gypsum	NA	e 4,000	e 2,500	r 5,000	6,103
Kaolin	e 500	e 500	e 200	e 7,000	7,540
Lime	4 4,887	4 e 6,000	4 e 4,000	26,909	22,837
Limestone	NA	NA	NA	NA	132,033
Salt—thousand tons	4 255	4 205	4 188	r 570	260
Mineral fuels:					
Petroleum refinery products:					
Gasoline—thousand 42-gallon barrels	------	--------	--------	--------	296
Jet fuel—do	------	--------	--------	--------	10
Distillate fuel oil—do	------	--------	--------	--------	301
Residual fuel oil—do	------	--------	--------	--------	NA
Liquefied petroleum gas—do	------	--------	--------	--------	3
Asphalt and other—do	------	--------	--------	--------	18

e Estimate. r Revised. NA Not available.

[1] Includes Eritrea.

[2] In addition to commodities listed, Ethiopia has produced small quantities of asbestos, barite, copper ore, lead ore, iron ore, mica, pumice, sulfur, and various construction materials, but quantitative data are not available.

[3] U.S. imports.

[4] Data are for years ending September 10.

COMMODITY REVIEW

Nonmetals.—*Cement.*—During 1967 the Government announced that it planned to have a 200,000-ton-per-year cement plant in operation in 1972, the end of the third 5-year development plan. The plant would be the fourth in the country; the existing three plants have a total capacity of 180,000 tons per year.

The Ethiopian cement market and the availability of raw materials were being studied during the year by the Canadian office of De Leuw, Cather and Co., a United States firm.

Potash.—The Ralph M. Parsons Co., Los Angeles, Calif., continued to develop the sylvinite deposit at Musley, near Dallol, in the Danakil Depression in northeastern Ethiopia. More than 2,000 feet of drift had been cut in the sylvinite beds by the end of 1966.[27] The main ore deposit is up to 10 meters thick and contains up to 52 percent sylvite.

Mineral Fuels.—Ethiopia's first refinery, at Assab, began operations in April, about a year behind schedule. The 10,000-barrel-per-day plant, built with technical and financial assistance from the U.S.S.R., is owned and operated by the Government-owned Ethiopian Refining Company. Output is expected to satisfy most of Ethiopia's requirements for refined products. The refinery's staff totals 550, including 40 to 50 Soviet technicians who will remain for varying periods of time to train Ethiopian refinery personnel.[28] Storage facilities total about 380,000 barrels for both crude oil (6 tanks) and refined products (52 tanks).

[27] Holwerda, J. G., and Hutchinson, R. W. Potash Bearing Evaporites in the Danakil Area, Ethiopia. Economic Geology, V. 63, No. 2, March–April 1968, p. 128, 138.

[28] The Ethiopian Trade Journal V. 5. No. 1, July, 1967, p. 42.

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Table 18.—Ethiopia: Foreign trade in mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations and sources, 1966
Exports:			
Metals:			
Iron and steel scrap	108	55	Japan 30; Italy 25.
Nonferrous scrap	e 1,000	103	Italy 72; United Kingdom 11.
Nonmetals:			
Clay construction materials	32	4	Tanzania 2; Sudan 1.
Gypsum and limestone	554	12	French Somaliland 11; Kenya 1.
Salt	79,503	165,523	Japan 138,640; Malaya 10,656.
Imports:			
Metals:			
Aluminum	352	433	Kenya 104; Italy 101.
Copper	42	28	Italy 23; Belgium 2.
Iron and steel:			
Pig iron and ferroalloys	8	51	U.S.S.R. 50.
Semimanufactures:			
Bars	3,405	2,442	Italy 727; Belgium 591; France 308.
Plate and sheet	17,355	18,279	Japan 14,353; Belgium 1,562.
Hoop and strip	274	152	Bulgaria 89; West Germany 44.
Tubes, pipes, and fittings	3,322	7,751	Israel 3,070; Italy 1,351.
Wire	2,454	3,759	Belgium 1,793; Italy 1,186.
Rails and accessories	630	636	Italy 200; France 109; Belgium 106.
Castings and forgings	394	143	Sweden 33; Italy 25; United Kingdom 23.
Total	27,834	33,162	
Nonferrous metals, n.e.s	1,000	2,310	Italy 2,209.
Nonmetals:			
Abrasives, natural	580	168	Italy 80; Iran 67.
Chemical, inorganic	1,680	825	Netherlands 376; Italy 288.
Clay construction material	1,280	1,973	Italy 895; Yugoslavia 336; West Germany 206; Czechoslovakia 202.
Lime, cement and other construction materials.	28,120	6,204	Israel 2,764; Yugoslavia 1,820.
Stone, dimension	85	88	Italy 52; Yugoslavia 36.
Sulfur	------	3	All from Norway.
Nonmetals, n.e.s	13,965	3,606	Iran 2,236; United States 830.
Mineral fuels:			
Coal	7,776	9,125	Poland 8,740.
Petroleum refinery products, unspecified. thousand 42-gallon barrels	r 1,072	2,101	Iran 1,300; Saudi Arabia 287.
Tar, pitch, and other crude chemicals from coal, oil, and gas distillation.	161	230	West Germany 62; France 60.
Salt	------	397	Unspecified 200; United Kingdom 189.

e Estimate. r Revised.

THE FRENCH TERRITORY OF THE AFARS AND ISSAS (FORMERLY FRENCH SOMALILAND)

There was no recorded production of mineral commodities in the French Territory of the Afars and Issas through 1967. However, small quantities of construction materials such as clay, sand, and gravel probably were extracted for local use. The last reported minerals production was in 1957 when the Compagnie des Salines de Djibouti closed their sea salt plant.

Trade in mineral commodities was confined to imports consisting principally of petroleum refinery products ($750,000), cement, lime and building materials, ($201,000), and crude and partly refined petroleum ($98,000). Total mineral imports were valued at $1.2 million compared with imports of all commodities valued at $23.1 million.

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Table 19.—The French Territory of the Afars and Issas (French Somaliland): Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966	Principal sources, 1966
Metals:			
Iron and steel:			
Castings and forgings, unworked	1,030	368	Belgium-Luxembourg 154; Japan 148.
Nonmetals:			
Cement, lime and other building materials.	15,691	10,682	U.S.S.R. 8,280; United Arab Republic 1,071; France 978.
Nonmetallic minerals, crude, unspecified	466	652	Italy 592.
Mineral fuels:			
Petroleum:			
Crude and partly refined	1,694	2,544	Nonspecified 2,512.
Refinery products	14,453	25,697	Nonspecified 24,987.

[1] Statistical Office of the European Communities. No. 8, 1966, pp. 57–65.

GAMBIA

Gambia had no recorded mineral production in 1967. The most significant event relating to the mineral industry was the issuance of revised Gambian laws regulating minerals and mining, providing for exploitation and exploration of Gambia's continental shelf, and extending its territorial sea and contiguous zone. The laws became effective on July 1, 1966.

Trade in mineral commodities in 1966 was confined mainly to imports of iron and steel semimanufactures valued at $368,000, cement valued at $179,000, petroleum refinery products valued at $100,000, and manufactured mineral fertilizers valued at $68,000. Imports of all commodities were valued at $12.4 million. Exports of mineral commodities consisted of remelted refined copper valued at $518,000. Exports of all commodities totaled $17.2 million in 1966.

Table 20.—Gambia: Foreign trade in selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal sources or destinations, 1966
Exports:			
Metals:			
Copper:			
Unwrought	152	610	Finland 356; Switzerland 254.
Wrought	339	------	
Zinc	360	NA	
Imports:			
Metals:			
Aluminum	9	NA	
Iron and steel: Semimanufactures	1,623	1,678	Japan 1,255; United Kingdom 423.
Nonmetals:			
Cement	8,752	8,407	All from United Kingdom.
Fertilizers, manufactured	-----	1,881	All from West Germany.
Mineral fuels:			
Petroleum products	2,383	280	All from United Kingdom.

[1] Statistical Office of the United Nations. Supplement to the World Trade Annual. 1965, V. III, pp. 320–324.
[2] Statistical Office of the United Nations. Supplement to the World Trade Annual. 1966, V. III, pp. 330–334.

GUINEA

Activity in Guinea's mineral industry in 1967 centered on mining and developing bauxite deposits and on alumina production; no iron ore has been mined since the end of 1966. Diamond mining in 1967 probably continued on the same scale as in past years, but no data were available; a Belgian firm reportedly assisted the Government of Guinea in some sectors of the diamond industry. The mineral industry's share of the 1966 GNP, estimated at $290 million, was estimated at 15 to 20 percent.

PRODUCTION AND TRADE

Production of both bauxite and alumina rose slightly in 1967. As in the past several years, the Government of Guinea did not release production figures for diamond. Information on Guinea's trade is incomplete.

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Table 21.—Guinea: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Aluminum:					
Bauxite—thousand tons	1,664	1,678	1,870	1,609	1,639
Alumina	480,035	484,350	522,142	525,310	529,980
Iron ore—thousand tons	662	908	755	e 1,600	----------
Nonmetals:					
Diamond:					
Gem—carats	[2] 22,000	[3] 20,568	e 21,000	e 21,000	NA
Industrial—do	[2] 32,000	[3] 51,166	e 51,000	e 51,000	NA

e Estimate. NA Not available.
[1] In addition to commodities listed, gold, simple construction materials, and clay products were also produced, but quantitative data on output were not available.
[2] Sales on tender; not necessarily true indigenous output.
[3] Exports.

Table 22.—Guinea: Foreign trade in mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations and sources, 1966
Exports:			
Metals:			
Aluminum:			
Alumina	511,198	520,218	NA.
Bauxite	244,042	NA	
Iron ore	715,528	338,345	NA.
Imports:			
Metals:			
Aluminum	NA	487	United States 471.
Iron and Steel:			
Pig iron	196	NA	
Semimanufactures	4,356	1,766	France 952; Belgium 661.
Nonmetals:			
Cement, lime, and other building materials.	8,602	25,748	France 20,786; West Germany 3,634.
Clay and clay products	385	1,436	France 811; Yugoslavia 625.
Fertilizers, manufactured	4,467	2,977	West Germany 1,980; United States 682; France 315.
Stone, sand, and gravel	22,800	NA	
Nonmetals, n.e.s	601	13	All from France.
Mineral fuels:			
Petroleum refinery products—thousand 42-gallon barrels	196	e 200	NA.

e Estimate.
Sources: United Nations. Supplement to the World Trade Annual. V. 3 (Africa), 1965 and 1966 editions. Natural Environment Research Council, Institute of Geological Sciences, Mineral Resources Division (London). Statistical Summary of the Mineral Industry, World Production, Exports and Imports, 1961–66.

COMMODITY REVIEW

Metals.—*Aluminum.*—Bauxite production in 1967 was from the Kimbo mine of Compagnie International pour la Production de l'Alumine (FRIA) and the Tamara Island mine of Harvey Aluminum, Inc. FRIA's production (1,617,000 tons) was converted into alumina; Harvey's (22,000 tons) was exported to company facilities in the Virgin Islands. Apparently no bauxite was mined at Kassa Island.

Compagnie des Bauxites de Guinée (Halco Mining, Inc., 51 percent; Guinea Government, 49 percent) continued development work at the Boké bauxite deposits, which rank among the world's largest high-grade bauxite deposits. Operations are expected to begin by 1969 or 1970 at an annual rate of 5 million tons. Development costs are estimated at a minimum of $30 million. The deposits are about 145 kilometers from the coast; the Government is to provide the necessary port, railroad, and townsite facilities.

The Aluminum Company of America (Alcoa) and Alcan Aluminum, Ltd., obtained interests in the Boké deposits by

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acquiring some of Harvey's shares in Halco Mining, Inc., late in 1966 and early in 1967, respectively. The major holders of the Halco consortium as of yearend 1967 were Harvey (51 percent) and Alcan and Alcoa (17.5 percent each); smaller shares are held by Montecatini Edison, S.P.A., Pechiney-Ugine, and Vereinigte Aluminum Werke, A.G. Alcan and Alcoa each agree to buy 1.2 million tons of bauxite annually for 5 years and 1.4 million tons annually for the next 15 years.

Iron Ore.—Société Minière de Conakry ceased operations at yearend 1966 because the Government would not permit it to obtain foreign exchange to buy new equipment. The company's marketing position had been handicapped throughout most of its operations because the ore has a relatively low tenor (53 percent iron) and contains comparatively large amounts of oxides of aluminum, chromium, and nickel. The Government reportedly was considering taking over the mine and operating it with technical aid from the U.S.S.R. and other East European countries.

IVORY COAST

The Ivory Coast's most important minerals continued to be diamond and manganese. Diamond output declined during 1967, but an increase in world diamond prices maintained the value level. Manganese production dropped because of low world market prices. There is a possibility that the country's mineral industry will be expanded to include iron ore. Less than 1 percent of the GNP, estimated at $1 billion in 1966, comes from the mineral industry.

The United Nations Special Fund and Société d'Etat pour le Dévelopment Minière de la Côte d'Ivoire (SODEMI), the State-owned company, continued prospecting for a variety of minerals, but no major discoveries were reported. SODEMI permitted work on a small gold deposit on one of its concession areas in the Issia region on an experimental basis. Output was so small, however, that the company was undecided whether it would continue the experiment.

PRODUCTION AND TRADE

Production in 1967 was valued as follows: Diamond, $3.6 million, about the same as during the past several years; manganese, $2.9 million, down from $3.7 million in 1966 and $3.8 million in 1965; cement, $7.3 million; petroleum products, $16.6 million, using imported crude oil valued at about $11 million.

Based on value, the chief mineral exports in 1966 continued to be diamond ($3.4 million) and manganese ($3.8 million). There was a slight change in the pattern of mineral imports in 1966 as compared with 1965. In 1966 crude oil became the principal mineral import, at $10.9 million compared with $3.6 million in 1965, as the Abidjan refinery began operation. Concurrently, refined product imports in 1966 decreased to $2.6 million from $9.4 million in 1965. Imports of iron and steel semimanufactures were valued at $8.9 million in 1966, slightly higher than in 1965. Imports of cement, lime, and dimension stone totaled $5 million, the same as in 1965. The country's balance of trade continued to be favorable for total trade but unfavorable in the mineral sector, as shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	8.8	277.2	3.2
1966	9.7	310.5	3.1
Imports:			
1965	31.1	r236.2	13.2
1966	33.2	257.6	12.9
Trade balance:			
1965	−22.3	r+41.0	XX
1966	−23.5	+52.9	XX

r Revised. XX Not applicable.
[1] Values given are for only those commodities listed in table 24 and 25 of this chapter.

COMMODITY REVIEW

Metals.—*Iron Ore.*—During 1967, Pickands Mather & Company held discussions with the Ivory Coast Government regarding the rights to mine iron ore southwest of Man. The deposit, one of about five discovered by SODEMI, contains an estimated 400 million tons of ore assaying about 40 percent iron. Pickands Mather reportedly was willing to invest about

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Table 23.—Ivory Coast: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Columbium-tantalum concentrate, kilograms	1,000	1,500	1,100	20	------
Manganese ore	139,063	136,425	179,785	176,186	149,433
Nonmetals:					
Cement, thousand tons	------	------	------	107	256
Diamond:					
Gem, carats	62,659	120,163	118,985	110,292	• 105,495
Industrial, do	117,000	80,108	79,323	73,528	• 70,330
Total, do	179,659	200,271	198,308	183,820	175,825
Mineral fuels:					
Petroleum refinery products:					
Gasoline, thousand 42-gallon barrels	------	------	------	1,183	1,251
Kerosine and jet fuel, do	------	------	------	535	579
Distillate fuel oil, do	------	------	------	1,242	1,341
Residual fuel oil, do	------	------	------	1,397	1,516
Liquefied petroleum gas, do	------	------	------	71	106
Total, do	------	------	------	4,428	4,793

• Estimate.

Table 24.—Ivory Coast: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [1]	Principal destinations, 1966
Metals:			
Aluminum	221	224	Upper Volta 76; Niger 46; Togo 36; Mali 30.
Copper	3	2	All to Niger.
Iron and steel:			
Scrap	7,091	6,320	Japan 3,379; Spain 2,120; Italy 701.
Semimanufactures	554	614	Mali 280; Niger 96; Upper Volta 92.
Lead	157	251	France 117; Belgium-Luxembourg 59; Italy 40.
Manganese ore and concentrate	170,524	177,028	United States 65,205; West Germany 27,790; United Kingdom 25,260; Spain 20,060.
Nonmetals:			
Abrasives, natural	2	------	
Diamond, carats	204,084	178,215	Mainly to France.
Cement, lime, and dimension stone	241	1,346	Upper Volta 1,220; Mali 121.
Clay products	36	41	Upper Volta 33; Mali 6.
Fertilizer materials, manufactured	279	465	Upper Volta 269; Cameroon 147.
Nonmetallic minerals, crude, n.e.s.	3,750	4,762	Upper Volta 4,756.
Mineral fuels:			
Coal, coke and briquets	13	30	All to France.
Petroleum refinery products	104	227	Mali 124; Nigeria 60.

[1] Office Statistique des Communautés Européenees, Côte d'Ivoire. No. 7, 1966, pp. 50–79, and No. 8, 1967, pp. 93–121.

$60 million in a preliminary processing plant in Man, a pipeline to transport the ore to San Pedro, and a pelletizing plant in San Pedro. The annual output of the operation would be about 2 million tons.

Manganese.—Operations at Compagnie de Mokta, the country's only manganese producer, slowed down in 1967 because of low world market prices. A description of the Grand Lahou deposit and the mining operation was published during the year.[29]

Nonmetals.—*Cement.*—A second cement company, Société des Ciments d'Abidjan, began production in February 1967 and produced 121,000 tons by yearend. The other cement company, Société Ivoirienne

[29] Metal Bulletin. No. 5248, Nov. 14, 1967, pp. 21–23.

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Table 25.—Ivory Coast: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [1]	Principal sources, 1966
Metals:			
Aluminum	578	1,866	Belgium-Luxembourg 1,104; France 665.
Copper	160	113	France 111.
Iron and steel:			
Scrap	27	4	NA.
Pig iron and ferroalloys	17	14	All from France.
Steel ingots and equivalent forms	(2)	2	France 1; Sweden 1.
Semimanufactures	46,365	46,456	France 30,943; Belgium-Luxembourg 11,598; West Germany 3,009.
Lead, all forms	97	74	France 59; Belgium-Luxembourg 13.
Nickel	1	1	All from France.
Silver, platinum troy ounces	32,151	(3)	Do.
Tin long tons	12	9	Do.
Zinc	27	41	France 34; U.S.S.R. 4.
Metallic ores, n.e.s	2	NA	
Nonferrous metals, n.e.s	2	1	All from France.
Nonmetals:			
Abrasives, natural	123	296	France 290.
Cement, lime, and dimension stone	260,827	272,970	Norway 68,431; Yugoslavia 51,299; West Germany 33,046; France 28,904; Senegal 27,005.
Clay products	2,606	3,205	France 1,910; West Germany 842; Italy 437.
Fertilizer materials:			
Natural	516	128	France 69; Belgium-Luxembourg 59.
Manufactured	19,420	26,315	France 9,010; West Germany 8,398; Belgium-Luxembourg 5,792; Italy 2,789.
Total	19,936	26,443	
Iron pyrites, unroasted	10	14	All from France.
Sand, gravel, and crushed rock	2,375	6,586	France 5,685; Italy 871.
Nonmetals, crude, n.e.s	23,346	29,453	Senegal 20,561; France 4,820; Algeria 1,974.
Nonmetallic mineral, manufactures	449	323	France 252; West Germany 40.
Mineral fuels:			
Coal, coke, and briquets	275	233	France 82; West Germany 59; Netherlands 51; Belgium-Luxembourg 31.
Petroleum, crude	198,558	616,293	Algeria 398,111; Gabon 218,181.
Petroleum refinery products	265,971	25,976	Venezuela 10,828; France 10,162; Italy 2,406.

[1] Office Statistique des Communautés Européenes, Côte d'Ivoire. No. 7, 1966, pp. 50–79 and No. 8, 1967 pp. 93–121.
[2] Valued at $1,000.
[3] Valued at $3,000.

de Ciments et Matériaux, began operations in 1966. Both firms produce cement from imported clinker.

Diamond.[30]—The country's principal diamond producer, Société Anonyme de Recherches et d'Exploitation Minières en Côte d'Ivoire, accounted for about 86 percent of the 1967 diamond output. During the year the company treated 645,385 cubic meters of gravel averaging 0.23 carat per cubic meter. Société Diamantifère de Côte d'Ivoire, ranking second in production, accounted for about 13 percent of 1967 output and was able to treat low-grade gravels (0.15 carat per cubic meter) because it had installed new grinding equipment and modified its treatment plant. Société Minière des Bandamas, ranking third in diamond mining, corrected the mechanical difficulties that had hampered its operations. Its output in 1968 is expected to be several times larger than the 3,027 carats it produced in 1967.

Mineral fuels.—*Petroleum.*—The Abidjan refinery processed about 5 million barrels of crude oil in 1967, its second year of operation, producing 4.8 million barrels of products. The refinery has satisfied most of the country's requirements for petroleum products.

[30] Mining Journal (London). Mining Annual Review. May 1968, p. 322.

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LESOTHO (FORMERLY BASUTOLAND)

The value of diamond produced in the Kingdom of Lesotho, the only reported mineral product of the nation, continued to increase reaching a new high in 1967. The Government passed a bill designed to attract industries to Lesotho to exploit and develop its mineral deposits. Titled the Mining Rights Act of 1967, the legislation established governmental administrative procedures necessary to obtain exploration and mining concessions. In February the Lesotho and United States Governments signed an Investment Guaranty Agreement to provide United States investors with risk guarantees for new investments in Lesotho. In June the Government established the Lesotho National Development Corp., a semiautonomous body, to promote and develop industry. As in previous years large numbers of Lesotho nationals were employed by mines in the Republic of South Africa. In 1966 there were an average 56,740 laborers employed in South Africa's mineral industry. These workers earned approximately $13.7 million which represented a large source of foreign exchange for Lesotho.

PRODUCTION AND TRADE

The recovery of alluvial diamonds by native diggers was the only recorded mineral industry activity. Production in 1967 increased to 21,737 carats valued at $1,434,848, compared with 12,506 carats valued at $976,087 in 1966.

Lesotho has recently started to compile trade statistics on a more reliable basis; however, the figures cannot be accepted as completely accurate.[31] Export of mineral commodities in 1965 consisted of diamonds valued at $876,400. All commodities exported in 1965 (the only year for which complete data was available) were valued at $6.6 million. Imports of mineral products in 1965 consisted chiefly of petroleum refinery products valued at $938,000. The value of all commodities imported in 1965 totaled $24.5 million.

COMMODITY REVIEW

Nonmetals.—*Diamond.*—In October the Government of Lesotho and Rio Tinto Zinc Corp. announced an agreement whereby Rio Tinto would prospect the diamond deposit at Letseng-la-Terai northeastern Lesotho to determine the feasibility of mining on a large scale.[32] After the prospecting period of 2 to 3 years, a company could be formed in Lesotho by Rio Tinto to operate the mine, construct roads and an airstrip and provide other associated services. The company would pay a 15-percent diamond sales tax and a 50-percent profit tax. A Lesotho Government agency would have the option of acquiring 25 percent of the company's shares at par. The agreement, which would be in effect for at least 25 years, provided for the training of Lesothos by Rio Tinto and the establishment of a diamond cutting and polishing industry.

The number of diamond buyers active in Maseru rose from 5 to 14. Reportedly the Kau kimberlite pipe, discovered recently, could be the third richest in the world.[33]

A 601.25 carat diamond found in the Maluti diggings at Letseng-la-Terai was sold in June reportedly for $649,600.[34]

[31] U.S. Embassy, Maseru. State Department Airgram A-11, Oct. 27, 1966, 6 pp.
[32] Bureau of Mines. Mineral Trade Notes. V. 65, No. 2, February 1968, p. 9, 10.
[33] Standard Bank Review (London). April 1967, p. 19.
[34] Work cited in footnote 32.

Table 26.—Lesotho: Production of mineral commodities

Commodity [1]	1963	1964	1965	1966	1967
Diamond:					
Gem—carats	585	726	2,777	3,367	4,682
Industrial—do	1,887	4,384	4,599	9,138	17,055
Total—do	2,472	5,110	7,376	[2] 12,506	21,737

[1] Export and production figures are theoretically the same except for a small undetermined quantity which is smuggled out of the country.
[2] Data does not add to total shown because of independent rounding.

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MALAWI

Mineral production in Malawi continued to be limited to building materials. In 1966, the latest year for which production data are available, 43,972 tons of cement was produced (31,493 tons in 1965) and 37,429 cubic meters of stone was quarried (37,700 cubic meters in 1965). Cement was produced by the Nyasaland Portland Cement Co. at Changalumi, near Zomba. Clay was also mined, but the amounts were not recorded. The mineral industry contributed very little to the GNP, estimated at $207 million in 1966, and no mineral exports were reported. The chief mineral imports in 1966 were, by value, iron and steel semimanufacturers, $761,000, and fertilizers, $546,000.

By yearend 1967 more than 80 percent of the country was mapped geologically at a scale of 1:100,000. Geochemical studies were made of sediments in waterways in areas where mapping was in progress, and several significant nickel, chromium, and columbium anomalies were found.[35]

There were no reports in 1967 regarding earlier plans to develop the 54-million-ton bauxite deposit on the Lichenya Plateau. Exploitation apparently depends upon construction of a railroad to the deposit, and on the building of an hydroelectric station on the Zambezi River at Cahora Bassa, about 290 kilometers away.

In January, London and Rhodesian Mining Company obtained prospecting rights at Kangankunde Hill, where monazite has been found. The ore within 100 feet of the surface is estimated at 294,321 tons and contains 5.58 percent high cerium monazite and 17.90 percent strontianite.

Table 27.—Malawi: Foreign trade of selected mineral commodities

(Metric tons unless otherwise spedified)

Commodity	1965	1966	Principal sources or destinations, 1966
Exports:			
Metals:			
Copper, alloys unwrought and refined.	363	--------	
Iron and steel, pig iron	5,346	--------	
Nonmetals:			
Other crude minerals	779	--------	
Imports:			
Metals:			
Aluminum, plates, sheets, strip and tubes.	128	362	All from United Kingdom.
Copper, alloys, worked and bars, wires, etc.	87	20	Do.
Iron and steel, semimanufactures	2,174	3,301	United Kingdom 1,922; Japan 723; Belgium 384.
Nonmetals:			
Cement and building products	788	385	All from United Kingdom.
Clay, brick refractory products	------	200	Do.
Fertilizers, manufactured	18,658	10,313	United Kingdom 8,114; West Germany 2,199.
Mineral fuels: thousand 42-gallon barrels Petroleum products.	e 453	e 454	NA.

e Estimated. NA Not available.

Sources: Statistical Office of the United Nations, Supplement to the World Trade Annual. V. 3, 1965 and 1966 editions, pp. 442–447, and pp. 448–456, respectively.

MALI

The mineral industry of Mali contributed a negligible amount to the 1967 gross national product estimated at about $312 million. Although a number of mineral deposits reportedly occur, few have been developed commercially, principally because of the lack of adequate transportation facilities. In September the International Development Association (IDA) approved a credit equivalent to $9.1 million for the rehabilitation and modernization of Mali's railways. Société Nationale de la Recherche Minière (SONAREM), a government agency, with assistance of

[35] Mining Journal (London). Mining Annual Review. May 1968, p. 311.

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Soviet technicians continued to search for exploitable mineral deposits. Soviet technicians also were constructing a 50,000-ton-per-year cement plant at Diamou, scheduled for completion in 1969. The Bureau de Recherches Géologiques et Minières (BRGM) conducted water well investigations and mapping studies of Mali.[36]

PRODUCTION AND TRADE

Gold was produced in the Kenieba area by local villagers. Figures on quantity were unavailable; however it was thought that production was minor. About 2,500 tons of marble was produced in the Bajoulabe area. This was approximately the same quantity as produced in 1966. Annual salt production reportedly is about 3,500 tons, but local officials cannot confirm this figure.

Mali's trade in mineral commodities was characterized mainly by imports of petroleum refinery products valued at about $2.3 million in 1966 (about $2.5 million in 1965) and iron and steel semimanufactures valued at almost $1.0 million in 1966 (almost $1.8 million in 1965).

Negligible exports of mineral products consisted chiefly of crude nonmetallic minerals valued at $146,000 in 1966 ($139,000 in 1965). The relationship of mineral trade to trade in all commodities during 1965 and 1966 was as follows:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade [2]	
Exports:			
1965	156	15,706	1.0
1966	219	13,100	1.7
Imports:			
1965	5,592	42,916	13.0
1966	4,931	35,950	13.7
Trade balance:			
1965	−5,436	−27,210	XX
1966	−4,712	−22,850	XX

XX Not applicable.
[1] Includes only those commodities listed in tables 28 and 29 of this chapter.
[2] Includes only trade under control of customs service; does not include imports of equipment for various aid projects and substantial uncontrolled trade with neighboring countries.

Table 28.—Mali: Exports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal destinations, 1966
Metals:			
Iron and steel:			
Scrap	28	------	
Semimanufactures	110	3	All to Senegal.
Nonmetals:			
Cement, lime, and other building materials.	61	24	All to Mauritania.
Nonmetallic minerals, crude, n.e.s.	1,110	1,075	Upper Volta 725; Niger 298.
Mineral fuels:			
Petroleum refinery products	1,731	32	All to Mauritania.

[1] Statistical Office of the European Communities. No. 9, 1966, pp. 27–40.
[2] Statistical Office of the European Communities. No. 4, 1967, pp. 35–45.

COMMODITY REVIEW [37]

Metals.—*Bauxite.*—About 800 million tons of 43 percent aluminum oxide (Al_2O_3) occurs on the Mandingue plateau near Bamako.

Gold.—Studies by SONAREM with the help of Soviet technicians have indicated alluvial reserves chiefly in the Yanfolila and Kéniéba areas. Studies of gold in rock deposits has indicated commercially exploitable reserves.

Manganese.—In the region of d'Ansonga investigations have revealed a reserve of 3.5 million tons of good quality ore.

Nonmetals.—*Diamond.*—Selection Trust Limited, which has been prospecting in the Kéniéba region for the last 3 years, failed to find commercial deposits and indicated that it will relinquish its prospecting permit.

Kaolin.—Clay mined from deposits in the Yanfolila region is used in a ceramic plant located at Bamako.

[36] Industries et Travaux d'Outremer. Bureau de Recherches Géologiques et Minières (Paris). Programme D' Activitiés 1967. No. 162, May 1967, p. 406.
[37] Industries et Travaux d'Outremer (Paris). No. 172, March 1968, p. 217.

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Table 29.—Mali: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal sources, 1966
Metals: [3]			
Aluminum	49	96	France 52; Ghana 17.
Copper	11	3	All from France.
Iron and steel:			
Scrap	29	65	France 45; U.S.S.R. 10.
Semimanufactures	7,579	5,450	France 1,846; Mainland China 1,678; U.S.S.R. 1,083.
Lead	4	1	All from France.
Tin, long tons	1	1	Do.
Zinc	15	--	
Nonmetals:			
Abrasives, natural	--	2	All from France.
Cement, lime and other building materials.	34,823	39,032	U.S.S.R. 19,089; United Arab Republic 13,397; Poland 4,900.
Clay construction materials	504	182	Bulgaria 103; West Germany 64.
Fertilizers, manufactured	--	75	France 75.
Stone, sand and gravel	74	106	United Arab Republic 100.
Nonmetallic minerals, crude, unspecified	15,279	20,854	Poland 10,165; Algeria 8,739; France 874.
Nonmetallic mineral manufactures	27	11	China (mainland) 6; France 4.
Mineral fuels:			
Coal, coke and briquets	98	37	France 20.
Gas, natural and manufactured	360	259	France 146; Ivory Coast 97.
Petroleum:			
Crude and partly refined	1	--	
Refinery products	72,380	74,439	Senegal 33,844; Ivory Coast 18,356.

[1] Statistical Office of the European Communities. No. 9, 1966, pp. 27–40.
[2] Statistical Office of the European Communities. No. 4, 1967, pp. 35–45.
[3] Includes unwrought and semimanufactures unless otherwise specified.

Phosphate.—A deposit of 20 million tons occurs about 100 kilometers north of Bourem. The French Fund for Aid and Cooperation has granted a loan for studying the feasibility of building an industrial complex to produce superphosphate.

Salt.—A reserve of 23 million tons of excellent quality salt occurs near Taoudenit about 795 kilometers north of Tombouctou. The possibility of using the salt for establishing industrial plants to produce products such as sodium hydroxide and chlorine was being studied.

MAURITANIA

Mining of iron ore, virtually the only commercial mineral produced in the Islamic Republic of Mauritania (a minor quantity of salt is also produced), contributed about 41 percent of the gross national product estimated at $133 million in 1967. Mauritania ranked second after Liberia among African iron ore exporters and among the ten largest producers in the world. Société des Mines de Fer de Mauritanie (MIFERMA) paid almost $6.2 million in taxes to the Government of Mauritania, about 27 percent of Government tax revenue. Although iron ore exports supplied a large part of Mauritania's foreign exchange earnings, sales of copper concentrates from a mine recently opened near Akjoujit, and shipments of rare earth mined at Bou Naga should soon supplement income from iron ore.

PRODUCTION AND TRADE

MIFERMA increased iron ore output 4 percent compared with that of 1966. Mining of the F'Derik deposit, initiated early in 1966, was largely responsible for the production rise. Salt output was reportedly small, probably attaining a level of production about equal to that of 1965.

The export of iron ore, which constituted 99.6 percent of the value of all mineral commodity exports, mainly was responsible for Mauritania's favorable balance in minerals and total trade.

Imports in 1966 consisted chiefly of iron and steel semimanufactures valued at $1.4 million and petroleum refinery products valued at $1.2 million. The relationship of minerals trade to trade in

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all commodities is shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	54.1	57.6	93.9
1966	64.4	69.2	93.1
Imports:			
1965	2.8	23.8	11.8
1966	3.3	22.4	14.7
Trade balance:			
1965	+51.3	+33.8	XX
1966	+61.1	+46.8	XX

XX Not applicable.
[1] Includes only those commodities listed in tables 31 and 32 of this chapter.

COMMODITY REVIEW

Metals.—*Copper.*—Société des Mines de Mauritanie (SOMIMA) was founded in March to mine the Guelb el Moghrabin deposit located near Akjoujit.[38] The SOMIMA consortium consists of Charter Consolidated (47 percent); Mauritanian Government (23 percent); French mining interests (19 percent); and Société Financière Internationale (11 percent). The company plans to invest $60 million in developing an open pit mine and associated facilities. Proved reserves total 8 million tons of copper oxide averaging 2.58 percent copper and 20 million tons of copper sulfide containing 1.51 percent copper. The oxide ore also contains 0.1 ounce per ton gold, while the sulfide ore averages 0.035 ounce of gold per ton. SOMIMA plans to export up to 50,000 tons per year of concentrates beginning in 1970. The mine will employ 400 workers and 90 foreign supervisors.

Iron Ore.—Société des Mines de Fer de Mauritanie (MIFERMA) shipped more than 7.4 million tons of ore from its open pit mines near Fort Gauraud.[39] Iron ore reserves in the Fort Gouraud area, reportedly among the largest in the world, were placed at 200 million tons in the principal ore body.[40] Three other deposits with comparable reserves occur at Rouessa Hamariat, Tazadit, and Azouazile. The

[38] Mining Magazine. Mauritania's Vast Mineral Wealth. V. 118, No. 4, April 1968, p. 223.
[39] Skillings Mining Review. V. 57, No. 5, Feb. 3, 1968, p. 16.
[40] The South African Mining and Engineering Journal (Johannesburg). Mauritania: New Source of Minerals. V. 79, No. 3918, Mar. 8, 1968, p. 538.

Table 30.—Mauritania: Production of mineral commodities

Commodity [1]		1963	1964	1965	1966	1967
Metals: Iron ore	thousand metric tons	1,678	5,080	6,284	7,157	e 7,448
Nonmetals: Salt e	metric tons	600	600	600	NA	NA

e Estimated.
[1] In addition to commodities listed, construction materials such as gypsum, clay, and sand and gravel are produced, but quantitative data are not available.

Table 31.—Mauritania: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal destinations, 1966
Metals:			
Iron and steel:			
Ore and concentrate. thousand tons	5,961	7,135	United Kingdom 1,596; France 1,455; Italy 1,305.
Scrap	1,250	1,285	Italy 1,135; Spain 150.
Semimanufactures	3	------	
Tin	1	1	All to France.
Other nonferrous metals	------	1	Do.
Nonmetals:			
Nonmetallic minerals, crude, unspecified	195	3,700	Congo (Brazzaville) 3,007; France 480 Congo (Kinshasa) 171.
Mineral fuels:			
Petroleum refinery products	2,892	5,962	Ship's stores 3,851; not specified 1,591; France 260.
Gas, natural and manufactured	------	2	All to Spain.

[1] Statistical Office of European Communities. No. 9, 1967, pp. 54–61.
[2] Statistical Office of European Communities. No. 10, 1967, pp. 92–94.

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Table 32.—Mauritania: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal sources, 1966
Metals:			
Aluminum	8	11	All from France.
Copper	42	24	France 23.
Iron and steel: Semimanufactures	5,185	7,333	France 6,381; West Germany 533.
Lead	11	3	All from France.
Tin—long tons	12	8	Do.
Zinc	2	3	Do.
Other nonferrous metals	15	6	All from United States.
Nonmetals:			
Cement, lime and other building materials.	8,210	6,266	France 3,259; Spain 2,997.
Clay construction materials	84	137	West Germany 98; France 30.
Fertilizers, manufactured	1,969	2,326	All from France.
Stone, sand and gravel	65	97	Do.
Other crude mineral products	786	131	Algeria 100; France 11.
Nonmetallic mineral manufactures	12	16	United States 10; France 5.
Mineral fuels:			
Coal, coke and briquets	10	384	NA.
Gas, natural and manufactured	246	279	France 237; West Germany 36.
Petroleum refinery products	37,585	45,035	Saudi Arabia 34,283; Iran 4,325; France 2,392.
Tar, pitch and other crude chemicals from coal, oil and gas distillation.	13	------	

NA Not available.
[1] Source: Statistical Office of European Communities. No. 9, 1967, pp. 54–59.
[2] Source: Statistical Office of European Communities. No. 10, 1967, pp. 86–91.

hematite ore lenses, averaging 62 percent iron, 0.03 to 0.04 percent sulfur and 0.02 to 0.03 percent phosphorus, occur interbedded with silicified quartzite. Ore seams outcrop above the surface and are worked by opencut methods using power shovels and 30 ton trucks. About 480 kilometers southwest of the Akjoujit region is the Legelitat el Khader deposit. This reportedly huge prospect contains hematite ore with 55 percent iron. At yearend 1967 additional mining and ore handling installations were being completed by MIFERMA. These included additional railroad rolling stock, expanded electrical power facilities, and a secondary crushing section and larger ore loading installations at Port Etienne.

Rare Earths.—A preliminary survey of an area near Bou Naga, 65 miles southwest of Akjoujit indicated reserves of 8,000 to 10,000 tons of ore containing 3.8 percent yttrium oxide and smaller quantities of europium.[41] The firm Péchiney Saint Gobain planned to mine and ship ore to La Rochelle, France, for extraction of yttrium oxide.

Mineral Fuels.—*Petroleum.*—Planet Oil Corp. obtained exploration rights to over 4 million hectares of onshore and offshore property extending from Nouakchott to the border with the Spanish Sahara.[42] Geophysical surveys conducted in Senegal indicated that the continental shelf in this area contains a favorable tectonic basin, which may extend into Mauritanian territory. American International Oil Co. (AMOCO) joined Planet Oil Corp. in prospecting on Planets recently assigned exploration permit area. AMOCO planned to start seismic prospecting and to drill at least two test wells. A petroleum exploration concession extending from Nouakchott to the Senegalese border was granted to an affiliate of Standard Oil Co. of New Jersey (ESSO).

NIGER

The mineral industry in the Republic of Niger in 1967 remained small; its contribution to the GNP, estimated at $263 million, was relatively insignificant. Highlighting the year was the formation of a company to develop a large recently discovered uranium deposit. When it becomes operational in 1970, the new industry will significantly help the country's economy.

[41] Work cited in footnote 38.
[42] Work cited in footnote 40.

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In May the Niger Government and the United Nations Special Fund signed a 3-year, $980,000 agreement providing for exploration in central and northwestern Niger. Exploration in the northwest is to concentrate on gold and manganese. Coal deposits in the Agadez area are also to be evaluated. Exploration in 1967 was primarily for molybdenum in the Liptako District and gypsum north of Tahoua.

PRODUCTION AND TRADE

Values for mineral production in 1967 were available only for cement and tin concentrate, which were $1,257,000 and $159,000, respectively.

The country's previous trade pattern of exporting mainly tin ore and concentrate and importing mainly petroleum refinery products and iron and steel semimanufactures continued in 1966. Exports of tin ore and concentrate in 1966 were valued at an estimated $170,000. Petroleum refinery products listed among exports, are in reality reexports. Imports of petroleum refinery products and iron and steel semimanufactures were respectively valued at $3,785,000 and $909,000. Niger continued to have an unfavorable balance of trade in 1966 in both mineral commodities and total trade, as shown in the following tabulation:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	e 273	25,319	e 1.1
1966	e 387	28,851	e 1.3
Imports:			
1965	4,222	37,661	11.2
1966	6,193	45,029	13.8
Trade balance:			
1965	e −3,949	−12,342	XX
1966	e −5,806	−16,178	XX

e Estimate. XX Not applicable.
[1] Values given are for only those commodities listed in table 34 of this chapter.

Table 33.—Niger: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Tin:					
Concentrate—long tons	81	74	77	85	79
Metal content of concentrate—do	54	48	53	e 60	55
Nonmetals:					
Building stone—cubic meters	757	455	604	NA	NA
Cement—thousand tons	NA	NA	NA	15	22
Clay, common brick—do	300				2,845
Gravel—cubic meters	1,534	4,822	3,020	NA	NA
Gypsum			1,500	e 1,500	1,729
Limestone	NA	NA	NA	NA	30,809
Sand—cubic meters	6,808	4,207	11,663	NA	[2] 2,179

e Estimate. NA Not available.
[1] In addition, an estimated 4,500 metric tons of salt was produced in 1967; data for other years are not available.
[2] Metric tons.

COMMODITY REVIEW

Metals.—*Uranium.*—After several years of prospecting, the French Commissariat d'Energie Atomique (CEA) discovered a large uranium deposit at Arlit.[43] Reserves are estimated at 20,000 tons in terms of uranium concentrate containing 70 percent metal. Other uranium deposits have been found at Azelik (estimated reserves 4,000 tons) and Madouela (estimated reserves 6,700 tons) but they are presently considered uneconomic because overburden totals 200 to 300 feet, more than twice that at Arlit.

A company was formed during the year to develop the Arlit deposit. This firm, Société des Mines de l'Air (SOMAIR), consists of CEA (40 percent), the Niger Government (20 percent), Compagnie de Mokta (20 percent), and Compagnie Francaise des Minerais d'Uranium (20 percent). According to the agreement

[43] Mining Magazine. V. 118, No. 1, January 1968, pp. 4–9.

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Table 34.—Niger: Foreign trade in mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal sources or destinations, 1966
Exports:			
Metals:			
Iron and steel: Semimanufactures	13	10	All to Upper Volta.
Tin ore and concentrate, long tons	66	[3] 80	NA.
Nonmetals:			
Fertilizer materials: Natural	46	NA	
Other crude minerals	1	NA	
Mineral fuels:			
Petroleum refinery products	1,989	2,565	Mali 1,564; Iraq 124; Netherlands Antilles 112.
Imports:			
Metals:			
Aluminum	135	290	Belgium-Luxembourg 181; Ivory Coast 48.
Copper	16	11	France 10.
Iron and steel: Semimanufactures	3,413	3,529	France 3,132; Belgium-Luxembourg 192.
Lead	2	1	France 1.
Tin, long tons	(4)	1	NA.
Nonferrous metals, ore and concentrate, unspecified.		[3] 1,055	NA.
Nonmetals:			
Cement, lime, and other building materials.	13,291	6,619	France 2,758; Algeria 2,287.
Clay construction materials	414	556	France 427; West Germany 112.
Fertilizer materials; manufactured	386	485	Netherlands 397; France 27.
Salt	NA	[3] 8,283	NA.
Stone, sand and gravel	106	192	France 192.
Nonmetallic minerals, crude unspecified.	5,298	8,297	Senegal 7,200; United Arab Republic 937.
Nonmetallic mineral manufacture	15	21	France 20.
Mineral fuels:			
Coal, coke and briquets	------	268	Nigeria 265.
Gas, natural and manufactured	176	226	France 93; Spain 63; Ivory Coast 52.
Petroleum refinery products	31,127	44,018	Iraq 9,645; Venezuela 8,591; Kuwait 4,927.
Tar, pitch, and other crude chemicals from coal, oil and gas distillation.	------	5	France 5.

NA Not available.
[1] Statistical Office of the European Communities. No. 9, 1966, pp. 191–199.
[2] Statistical Office of the European Communities. No. 9, 1968, pp. 107–117.
[3] Donnes Statistiques. No. 1, January–March 1968.
[4] Less than ½ unit.

creating the company, the uranium is to be sold at $8 per pound and the Niger Government is to get 50 percent of the profits. SOMAIR's initial capital totaled $14 million; total investment through 1973 is expected to total $45 million. A concentrating plant is scheduled to be operating in 1970 with an annual capacity of 200 tons; the capacity is envisaged at 1,000 tons by 1973.

RWANDA

The Republic of Rwanda's mineral industry in 1967 continued to be dominated by cassiterite, the chief mineral mined and exported. The industry accounted for about 2 percent of the GNP, estimated at $160 million in 1967. During the year the Government enacted two mining laws: The Mining Code of 30 January 1967 [44] and Presidential Decree No. 55/10 of 2 March 1967.[45] The mining code classifies mineral deposits in quarries or mines and deals with various regulations. The decree defines procedures for obtaining various permits.

PRODUCTION AND TRADE

The pattern of mineral production in 1967 was essentially the same as in past years. Cassiterite production was valued at an estimated $2.4 million. Gold and

[44] Journal Officiel de la République Rwandaise. V. 6, No. 4, Feb. 16, 1967, pp. 64–83.
[45] Journal Officiel de la République Rwandaise. V. 6, Mar. 15, 1967, pp. 149–159.

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concentrates of tin and tungsten continued to be smuggled out of the country, but reportedly on a smaller scale than in the past.

Trade data for 1966 are incomplete. Presumably, most of the trade continued to be with western Europe, and the balance of trade in mineral commodities continued to be favorable.

Table 35.—Rwanda: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Beryl	256	298	[3] 151	133	109
Columbite-tantalite concentrate	30	29	50	25	31
Gold—troy ounces	NA	NA	NA	106	3
Tin:					
Cassiterite concentrate [2]—long tons	1,866	2,020	2,006	1,855	1,929
Content of concentrate—do	1,271	1,360	• 1,424	• 1,340	• 1,393
Tungsten: Wolframite ore and concentrate	12	138	253	363	538
Nonmetals:					
Lithium mineral (amblygonite)	368	295	------	NA	NA
Mineral fuels:					
Natural gas, methane—million cubic feet	-----	------	35	NA	NA

• Estimate. NA Not available.
[1] In addition to commodities listed, simple construction materials such as clay, and sand and gravel are also produced, but quantitative data are not available.
[2] United States imports.
[3] Includes small quantity of mixed cassiterite-columbite-tantalite concentrate.

Table 36.—Rwanda: Principal mineral commodity trade

(Metric tons unless otherwise specified)

Commodity	1965	1966 [1]	Principal destinations and sources
Exports:			
Beryl	686	NA	
Cassiterite concentrate [2]	2,006	• 1,800	NA.
Columbite-tantalite concentrate	50	• 25	NA.
Lithium mineral (amblygonite)	------	NA	
Wolframite ore and concentrate	157	91	Italy 30; Sweden 20; United Kingdom 16.
Imports: [3]			
Aluminum	128	46	All from United Kingdom.
Copper	34	NA	
Iron and steel, mainly semimanufactures	2,740	1,858	Belgium 1,292; Japan 566.
Cement	12,422	NA	
Salt	4,953	NA	
Fuels, mainly petroleum products	13,128	658	All from United Kingdom.

• Estimate. NA Not available.
[1] Except for estimated figures, data are from Statistical Office of United Nations, Supplement to the World Trade Annual, v. 3, 1966, pp. 656–660.
[2] Includes small quantity of mixed cassiterite-columbite-tantalite concentrate.
[3] Includes unwrought and semimanufactures unless otherwise specified.

COMMODITY REVIEW

Metals.—*Tin.*[46]—During the year MINETAIN installed a washing and crushing plant to treat the pegmatite ores mined in the Katumba South District. Extensions of known mineralized areas have been found in the Katumba North and Lutsiro regions.

Mineral Fuels.—*Petroleum.*—No action was taken in 1967 on past proposals to further develop the natural gas in Lake Kivu. Natural gas is dissolved in the lake water, and various methods of exploiting the deposit have been considered. The reserves are estimated at 2 trillion cubic feet. Because the lake is in both Rwanda and the Republic of the Congo (Kinshasa), agreements would have to be reached between the two countries before the deposit could be developed.

[46] Mining Journal (London). Mining Annual Review, May 1968, p. 309.

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SOMALI REPUBLIC

The mineral industry remained an unimportant part of the economy of the Somali Republic in 1967, when the country's GNP was estimated at $15.5 million. The only minerals produced were meerschaum and salt. Deposits of bauxite and phosphate of possible economic size reportedly were found in 1967 by a United Nations investigating team, but no details were given. During the year the United Nations Special Fund continued investigating the Alio Ghelle radioactive anomaly, one of several found in the Bur Region by aerial scintillometer surveys made in 1965 and 1966. Ground investigations have revealed the presence of uranium, thorium, and rare earths. Exploration for oil continued.

PRODUCTION AND TRADE

Mineral production was estimated to have been relatively insignificant in 1967. Meerschaum production was estimated at 40 tons, approximately the same as estimated production of past years. Salt production was not reported in 1967; output in tons for recent years was as follows: 1963, 2,200; 1964, 5,581; 1965, 5,000; 1966, less than 500.

Trade data for 1966 were not available as of mid–1968. Presumably the trade pattern of previous years continued, with exports being very small and imports being comprised chiefly of iron and steel, cement, and petroleum refinery products.

Table 37.—Somali Republic: Foreign trade in selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966 [1]	Principal sources or destinations, 1966
Exports:			
Metals:			
Copper scrap	---	79	All to Italy.
Iron and steel:			
Scrap	25	NA	
Semimanufactures	4	NA	
Silver, platinum and platinum group metals. troy ounces	3,858	NA	
Nonferrous metals, scrap	109	137	All to Italy.
Nonferrous metals, unspecified	75	NA	
Nonmetals:			
Salt	20	NA	
Stone, sand and gravel	5	NA	
Mineral fuels: Petroleum refinery products	315	NA	
Imports:			
Metals:			
Aluminum	32	NA	
Copper, alloys, wrought	6	21	All from Italy.
Iron and steel:			
Pig iron and ferroalloys	532	NA	
Ingots and primary forms	333	NA	
Semimanufactures	7,389	1,926	Italy 1,367; Japan 537.
Lead	2	NA	
Silver, platinum and platinum group metals. troy ounces	3,277,185	NA	
Tin. long tons	124	NA	
Nonferrous metals, n.e.s.	214	NA	
Nonmetals:			
Cement, lime, and other building materials	40,782	685	All from Italy.
Clay construction materials	1,354	NA	
Fertilizers:			
Natural	114	NA	
Manufactured	3,575	1,029	All from Italy.
Salt	215	NA	
Nonmetallic minerals, crude, unspecified	41	NA	
Nonmetallic mineral manufactures	626	668	All from Italy.
Mineral fuels:			
Crude and partly refined petroleum	4	NA	
Petroleum refinery products	427	e 440	NA.
Tar, pitch and other crude chemicals from coal, oil, and gas distillation.	37	NA	

e Estimated. NA Not available.
[1] Except for petroleum refinery products, data are from the Supplement to the World Trade Annual. V. 3, 1966, Statistical Office of the United Nations, pp. 176–182.

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COMMODITY REVIEW

Mineral Fuels.—*Petroleum.*—In November, Sinclair Somal, a U.S.-West German consortium, began drilling an exploratory well, Galtardo 1, north of Mogadiscio, near Giohar.[47] The well is near Sinclair's 1966 exploratory well, Afgol 1, which was drilled to 13,661 feet before being abandoned as a noncommercial gas well. Sinclair Somal has concessions totaling 104,709 square kilometers. Two other concessionaires are Hammar Petroleum Corp., with 76,234 square kilometers, and Scebel Oil, with 61,480 square kilometers. These companies reportedly plan some exploratory drilling in 1968.

SPANISH SAHARA

In May the Spanish Government began negotiations with International Minerals and Chemical Corporation (IMC) regarding the development of the 1.7-billion-ton phosphate deposit at Bou-Craa. Early in 1968, however, IMC withdrew its offer, apparently because of disagreements over the rate at which the deposit should be exploited.[48] The development plans of Empresa Naçional Minera del Sahara, S.A., the Spanish National mining company, call for exports of 3 million tons by 1970 and 10 million tons annually by 1975. A harbor as well as ship-loading facilities were under construction during 1967.

Oil exploration continued to be unsuccessful. Drilling during the year was by two joint ventures: Compañía Espagñola de Petróleos, S.A. and Spanish Gulf Oil Company (one offshore well), and Investigaciones Petrolíferas, S.A., and Instituto Nacional de Industria (4 onshore wells).[49]

SUDAN

The mineral industry remained relatively unimportant to Sudan's economy in 1967, accounting for less than 1 percent of the estimated $1.5 billion GNP, but there was continuing interest in exploring for petroleum and other mineral commodities. During the year the United Nations Development Program approved a 4-year mineral survey project covering 70,000 square kilometers in Kassala Province along the Ethiopian border, 47,000 square kilometers in Darfur Province, and 6,000 square kilometers in Northern Province. The Government of Sudan will contribute $750,000 of the $2 million total project cost. Considerable interest was aroused by the discovery of a large mineralized area at a depth of 7,000 feet in the Red Sea between Port Sudan and Jidda, Saudi Arabia.[50]

PRODUCTION AND TRADE

Official production data for 1967, as for the past several years, were not available. However, except for a rise in output of petroleum refinery products, production was estimated to have been the same or slightly below that of 1966.

The chief exports in 1966 were nonferrous scrap ($584,000), iron ore ($498,000), and iron and steel scrap ($311,000). There was a change in the import pattern in 1966, as compared with 1965, due to the operation of the petroleum refinery. Imports of petroleum products dropped from $9.6 million in 1965 to $3.7 million in 1966, whereas imports of crude oil rose from an estimated $5 million in 1965 to an estimated $8 million in 1966. Other significant imports in 1966 were iron and steel semimanufactures ($8.4 million) and fertilizer materials ($6.2 million). The country's balance of trade remained unfavorable, as shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	2.5	195.0	1.3
1966	1.6	203.0	0.8
Imports:			
1965	r e 31.5	207.5	r e 15.2
1966	30.0	222.3	13.5
Trade balance:			
1965	r e −29.0	−12.5	XX
1966	−28.4	−19.3	XX

e Estimated. r Revised. XX Not applicable.
[1] Values given are for only those commodities listed in tables 39 and 40 of this chapter.

[47] Oil and Gas Journal. V. 65, No. 47, Nov. 20, 1967, p. 157.
[48] The Wall Street Journal. Jan. 31, 1968, p. 8.
[49] World Oil, V. 167, No. 3, Aug. 15, 1968, p. 186.
[50] Engineering and Mining Journal. V. 169, No. 1, January 1968, pp. 102 and 104.

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Table 38.—Sudan: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965 [1]	1966 [1]	1967 [1]
Metals:					
Chromite—thousand tons	20	17	30	17	15
Gold—troy ounces	868	877	300	200	200
Iron ore—thousand tons	-----	(2)	35	39	38
Manganese ore	e 250	e 8,500	1,000	1,500	1,500
Silver—troy ounces	-----	40	-------	-------	-------
Nonmetals:					
Cement—thousand tons	116	91	80	100	90
Gypsum	4,520	4,520	4,290	1,921	1,800
Magnesite	-----	-------	-------	3,000	3,000
Natron	-----	151	427	NA	NA
Salt—thousand tons	37	60	52	43	40
Mineral fuels: Petroleum refinery products thousand 42-gallon barrels	-----	-------	2,155	4,174	5,500

e Estimated. NA Not available.
[1] All data estimated.
[2] Less than ½ unit.

Table 39.—Sudan: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Chromite	10,160	--------	
Copper	r 100	--------	
Iron ore	34,567	47,694	Yugoslavia 38,550; United States 9,144.
Iron and steel scrap	1,680	9,113	United Arab Republic 8,307; Japan 806.
Manganese ore	e 2,000	1,150	Yugoslavia 1,150.
Nonferrous metal scrap	1,387	999	Italy 852; United Arab Republic 74.
Nonmetals:			
Natron	427	NA	
Salt	785	1,711	Ethiopia 1,129; Chad 581.
Natural sodium carbonate	------	7	Syria 5; Saudi Arabia 2.
Mineral fuels:			
Petroleum refinery products thousand 42-gallon barrels	2	275	NA.

e Estimated. NA Not available. r Revised.

Source: Statistical Office of the United Nations and Sudan Department of Statistics. Foreign trade statistics annuals, 1965 and 1966.

COMMODITY REVIEW

Metals.—*Chromite.*—During 1967 the Mining and Trading Co. Ltd. of Sudan began exporting chromite to the French firm Caronte. The company had exported the ore to the United States until the end of 1966. General Mining Enterprises, S.A., began removing the overburden on several chromite mining leases it obtained in the Ingenessa Hills. The company, which employs about 120, has agreed to sell ore to a firm in the Netherlands; however, exports are not expected to begin until at least 1968.

Nonmetals.—*Limestone.*—The Nile Cement Co., at Rabak, began searching for new limestone deposits because the deposit south of Rabak were found to contain 8 to 14 percent magnesium, which is too high for cement. A small suitable limestone deposit has been found about 20 kilometers east of Rabak. The company hopes to obtain assistance from the United Nations Special Fund to find a larger deposit.

Mineral Fuels.—*Petroleum.*—Early in 1967 Digna Petroleum Co. (Sudan) Ltd. obtained concessions totaling 1.1 million hectares along the Red Sea Coast between the Eritrean border and Port Sudan. Continental Oil Co. of Sudan, the operating company for Digna, also has Sudanese and Kuwaiti interests. Aero Service Corp. of Philadelphia made an aerial magnetic survey of the concessions. Tenneco Oil Co. also obtained concessions along the Red Sea Coast. Three of the nine con-

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Table 40.—Sudan: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum	r 507	1,212	Mainland China 569; United Kingdom 464; U.S.S.R. 111.
Copper	296	60	United Kingdom 40.
Iron and steel:			
Scrap	18	---	
Ingots and other primary forms	57	170	United Kingdom 150; Italy 20.
Semimanufactures	108,307	90,477	Mainland China 27,525; India 20,081; Belgium-Luxembourg 10,849; United Kingdom 8,964.
Lead	r 61,237	146	United Kingdom 115; Sweden 31.
Tin----long tons	45	60	United Kingdom 11.
Zinc	169	55	Poland 23.
Nonferrous metals, n.e.s	9	---	
Metallic oxides, mainly for paints	141	157	West Germany 42; France 30.
Nonmetals:			
Abrasive materials:			
Natural	35	52	West Germany 30; United Kingdom 20.
Grinding stones and wheels	225	302	Denmark 188; United Kingdom 10.
Asphalt, natural	101	---	
Cement----thousand tons	83	48	Yugoslavia 35; U.S.S.R. 4; Italy 3.
Chalk	762	340	Belgium-Luxembourg 267.
Clays, crude, undifferentiated	253	308	NA.
Clay construction materials, including brick and tile.	668	704	Yugoslavia 209; Czechoslovakia 162; United Kingdom 160.
Fertilizer materials:			
Manufactured:			
Nitrogenous	76,606	74,086	Netherlands 25,668; Italy 15,997; U.S.S.R. 14,463.
Phosphatic	49	164	Belgium 90; Netherlands 65.
Potassic	20	---	
Mixed	861	9	France 5; Netherlands 4.
Sulfuric acid and other inorganic acids.	167	228	United Kingdom 78; Netherlands 60; West Germany 43.
Gypsum	196	683	Cyprus 247; United Arab Republic 189; Yugoslavia 188.
Lime	29	1,211	All from United Kingdom.
Mica:			
Crude	1	3	All from Japan.
Worked	10	NA	
Potash, caustic	1	21	Mainland China 20.
Pyrite, unroasted	3	NA	NA.
Salt	59	61	United Kingdom 39; Netherlands 22.
Sand, gravel and crushed stone	40	49	Belgium 30; United Kingdom 13; Yugoslavia 6.
Soda, caustic	2,196	3,844	Netherlands 1,766; United Kingdom 1,232.
Stone, dimension	18	4	N.A.
Nonmetallic minerals, crude, n.e.s	121	46	West Germany 27; Mainland China 10; Norway 5.
Chemical elements and bases, inorganic, n.e.s.	80	27	West Germany 15; United Kingdom 7; France 3.
Nonmetallic mineral manufactures, n.e.s.	996	835	Yugoslavia 425; United Arab Republic 188; Italy 103.
Mineral fuels:			
Coal	6,362	---	
Coke and semicoke	909	300	All from West Germany.
Petroleum: Crude----thousand 42-gallon barrels	e 2,155	e 4,450	All from Iran.
Refinery products:			
Gasoline----do	416	93	NA.
Kerosine----do	240	39	NA.
Distillate fuel oil----do	694	172	NA.
Residual fuel oil----do	300	73	NA.
Lubricants----do	77	77	United Kingdom 21; United States 14; Austria 14.
Asphalt and bitumen----do	24	12	NA.
Liquefied petroleum gas----do	9	3	NA.
Total	1,760	469	
Mineral tar and crude chemicals from coal, oil and gas distillation.	221	---	

r Revised. NA Not available. e Estimated.

Source: Statistical Office of the United Nations and Sudan Department of Statistics. Foreign trade statistics annuals, 1965 and 1966.

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cessions formerly held by Agip Mineraria (Sudan) Ltd. were retained by the Government of Sudan.

The Government was considering exercising its option to buy half interest in the 20,000-barrel-per-day Port Sudan refinery, the country's only refinery. The half interest would cost $4.3 to $5.0 million. The refinery, which began operations in September 1964, is owned by Shell Oil Co. and British Petroleum Co. Ltd.

SWAZILAND

The mineral industry of the British self-governing protectorate of Swaziland was a significant contributor to the area's economy. Production of minerals, valued at $24.5 million in 1967, accounted for a large share of the territory's export earnings. In 1966 the value of mineral production, $21.7 million, was almost 41 percent of the total value of exports estimated at $53.7 million. Mineral industry employment in 1967 averaged about 2,380 workers out of a total of approximately 27,100 persons employed by major sectors of the economy. In addition, about 1,600 Swazis were employed in gold mines in the Republic of South Africa.

A mineral survey being conducted by the Swaziland Government and the United Nations Development Program continued to make progress. An electromagnetic aerial survey was conducted over several areas. In September the United States and Swaziland Governments signed an investment Guaranty Agreement. The agreement enables United States investors to obtain insurance for enterprises established in the country.

PRODUCTION

The substantial increase in value of production in 1967 was chiefly the result of increased iron ore output, valued at more than $15.8 million compared with about $14.5 million in 1966. Asbestos output also rose considerably, to more than $8.2 million, compared with an almost $7.0 million output in 1966. Kaolin output value increased sharply to $26,173 compared with a $7,913 output in 1966. Coal output increased again, continuing the rising trend of the last 4 years. Coal output in 1967 was valued at $257,912 compared with $179,347 in 1966.

TRADE

Official trade statistics for 1965 were reported; however, only preliminary 1966 figures were available. Mineral commodity exports consisted chiefly of iron ore ($10.9 million in 1966 and $6.2 million in 1965), asbestos ($7.0 million in 1966 and $8.1 million in 1965), and coal (almost $53,000 in 1966 and more than $14,000 in 1965).

Mineral commodity imports were mainly petroleum refinery products (more than $3 million in 1966 and almost $2.8 million in 1965), fertilizers ($1.4 million in 1966 and $1.6 million in 1965), and cement, bricks and asbestos products ($975,800 in 1966 and $1.2 million in 1965). Trade in mineral commodities compared with trade in all commodities is shown as follows:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	14.4	43.0	33.5
1966	18.0	53.7	33.5
Imports:			
1965	7.2	36.6	19.7
1966	6.8	36.0	18.9
Trade balance:			
1965	+7.2	+6.4	XX
1966	+11.2	+17.7	XX

XX Not applicable.
[1] Values given are for only those commodities listed in table 42 of this chapter.

COMMODITY REVIEW

Metals.—*Iron Ore.*—Mining operations at the Ngwenya deposit of Swaziland Iron Ore Development Co. Ltd. (S.I.O.D.C.) were described.[51] The hematite ore body, near the summit of the Ngwenya mountain range, has indicated reserves of 30 million tons, averaging 62.5 percent iron. Mining is by the open pit with ore loaded into 35-ton-capacity trucks by electric power shovels. Ore is trucked to a crusher station, and then moved by conveyor belt 2.4 kilometers down

[51] Mining Magazine. Swazi Iron for Japan. V. 116, No. 3, March 1967, pp. 154–155, 157.

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Table 41.—Swaziland: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity [1]	1963	1964	1965	1966	1967
Metals:					
Beryl	2	------	------	------	------
Gold, troy ounces	2,092	2,078	1,619	308	NA
Iron ore	------	60,193	1,019,957	1,591,222	1,743,522
Tin in concentrates, long tons	3	3	2	1	NA
Silver, troy ounces	120	130	130	r 28	NA
Nonmetals:					
Asbestos, chrysolite	30,255	36,162	37,089	32,787	36,427
Barite	84	15	491	1,043	565
Diaspore	58	374	------	------	------
Kaolin	2,006	312	753	587	1,860
Pyrophyllite	2,769	1,995	920	435	599
Mineral fuel:					
Coal:					
Anthracite	- ---	4	20	67	------
Bituminous	------	4,073	29,966	66,759	77,962

r Revised. NA Not available.
[1] In addition to commodities listed, simple construction materials such as clay and sand and gravel were produced, but quantitative data are not available.

Table 42.—Swaziland: Foreign trade in selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destination or sources, 1966
Exports:			
Metals:			
Gold, troy ounces	1,619	308	All to Republic of South Africa.
Iron ore, thousand tons	1,020	1,591	All to Japan.
Silver, troy ounces	130	28	All to Republic of South Africa.
Tin concentrates, long tons	2	1	Do.
Nonmetals:			
Asbestos, chrysotile	37,088	32,787	United Kingdom 16,441; Republic of South Africa 7,282; Spain 3,719; Argentina 907.
Barite	491	1,043	All to Republic of South Africa.
Kaolin	753	587	Do.
Pyrophyllite	920	435	Do.
Mineral fuels: Coal	7,589	e 1,963	Mozambique 1,552 e, Kenya 411 e.
Imports: [1]			
Metals:			
Steel reinforcement and corrugated iron, value, thousands	$381	$347	NA.
Steel windows, doors, and frames, value, thousands	$161	$151	NA.
Plumbing and sanitary fitting, do	$251	$294	NA.
Nonmetals:			
Cement, bricks, and asbestos products, value, thousands	$1,155	$976	NA.
Piping for buildings, irrigations, etc., value, thousands	$917	$526	NA.
Fertilizer, do	$1,557	$1,415	NA.
Mineral fuels:			
Petroleum, do	$1,208	$1,277	NA.
Diesel oil, do	$811	$935	NA.
Lubricating oils and greases, do	$328	$361	NA.
Total, do	$6,769	$6,282	

e Estimate. NA Not available.
[1] Government Statistical Office (Mbabane). Swaziland Statistical News, No. 1, 1967, pp. 3–5.

the mountain to a screening station, storage yard, fines dump, and railway siding. Ore is then hauled by rail 275 kilometers to Lourenco Marques, where it is loaded on 79,000-ton-capacity ships for transport to Japan.

Tin.—Swaziland reportedly was making plans to increase output of cassiterite.[52] A rich tin mineral deposit near Mbabane in concession No. 28 was scheduled to be mined on a 24-hour basis.

[52] Tin International. V. 40, March 1967, p. 68.

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Nonmetals.—*Asbestos.*—The Havelock Asbestos mine in northwestern Swaziland, near the border with Transvaal was the subject of a recent report.[53] A 20-kilometer aerial ropeway connects the mine with the railhead at Barberton, Republic of South Africa. The underground mine has been developed in a massive serpentine ore body of variable width, averaging 45 meters in the upper levels and nearly 1,400 meters in length. Ore is mined by caving and gravity extraction and hoisted to a surface plant for crushing and for screening in a modern air-separation plant. The mine employed a total of 1,700 workers.

TOGO

Phosphate rock mining remained the chief mineral industry of the Republic of Togo and continued to be an important source of foreign exchange and government revenue. In 1967 the Government received an estimated $2 million in dividends and taxes from the phosphate industry. About 5 percent of Togo's GNP, estimated at $154 million 1966, was from the mineral industry. Additional iron ore deposits have been found in the Buem basin; they are comparable in both tonnage and grade with the Bangéli iron ore deposit, discovered earlier, which has reserves estimated at 50 million tons, averaging 40 to 50 percent iron.[54] Other investigations have indicated reserves of about 20 million tons of almost pure dolomite at Ghanoule, near Mont Ahito.[55] A company is to be established to study the feasibility of developing the deposit. Interregionally, Togo entered into an agreement with Dahomey and private French interests to study limestone deposits at Aveta in Togo and Toffo in Dahomey with the intent of working one of the deposits to supply clinker to a cement plant in Dahomey.

PRODUCTION AND TRADE

Production of phosphate rock, the only mineral mined commercially, continued to rise steadily. Production for recent years, in thousands of metric tons, was as follows: 1963, 515; 1964, 752; 1965, 966; 1966, 1,114; 1967, 1,123.

Phosphate rock continued as Togo's chief mineral export. In 1966 phosphate rock exports were valued at $15,277,000, compared with $10,767,000 in 1965. Togo's principal mineral commodity imports in 1966 continued to be those of previous years, including petroleum refinery products ($1,915,000 in 1966; $1,539,000 in 1965), iron and steel semimanufactures, ($1,896,000 in 1966; $1,544,000 in 1965), and cement, lime, and other building materials ($1,259,000 in 1966; $1,189,000 in 1965). The balance of Togo's mineral trade as compared with the total trade balance is given in the following tabulation:

	Value (thousand dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	r 10,787	27,056	r 40.0
1966	15,381	35,942	42.8
Imports:			
1965	4,888	44,963	10.9
1966	5,806	47,240	12.3
Trade balance:			
1965	r +5,899	−17,907	XX
1966	+9,575	−11,298	XX

r Revised. XX Not applicable.
[1] Values given are for only those commodities listed in table 43.

COMMODITY REVIEW

Nonmetals.—*Phosphate.* — Compagnie Togolaise des Mines du Bénin (CTMB), the operator of the Hahotoe phosphate mine, continued training Togolese in mining and refining operations at a center that was established in 1966. The company hopes to have Togolese workers gradually replace the approximately 100 expatriates presently employed. The labor force totaled about 1,100.

During the year, W.R. Grace and Company (37 percent interest in CTMB), submitted a superphosphate production plan to the Togolese Government. The project, which originally had been proposed about 3 years ago, would require an investment of about $800,000.[56]

[53] Swaziland Teachers Journal. Havelock Asbestos Mine. September 1967, p. 32.
[54] Mining Journal (London). Mining Annual Review, May 1968, p. 324.
[55] Work cited in footnote 54.
[56] Work cited in footnote 54.

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Table 43.—Togo: Foreign trade in selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources or destinations, 1966
Exports:			
Metals:			
Iron and steel:			
Scrap	228	291	All to Dahomey.
Semimanufactures	52	44	Dahomey 25; Niger 8; France 3.
Nonmetals:			
Fertilizer materials:			
Phosphate rock	r 754,142	968,733	France 333,869; Netherlands 189,397; Australia 166,631.
Stone, sand and gravel	59	4	All to France.
Nonmetallic minerals, crude unspecified.	103	118	Niger 95; Dahomey 22.
Mineral fuels:			
Petroleum refinery products, mainly lubricants.	24	278	Dahomey 275.
Imports:			
Metals: [1]			
Aluminum	67	98	France 65; Ivory Coast 31.
Copper	37	21	All from France.
Iron and steel:			
Scrap	4	58	Ghana 8.
Pig iron and ferroalloys	2	NA	
Semimanufactures:			
Bars, rods, and sections	3,609	5,332	West Germany 2,400; France 2,390.
Plate and sheet	2,489	3,340	Japan 2,511; France 563.
Rails and accessories	578	349	France 247; West Germany 102.
Tubes and fittings	1,903	1,624	West Germany 784; France 495; Ivory Coast 326.
Other	120	355	West Germany 303; France 44.
Total	8,699	11,000	
Lead	7	18	Belgium-Luxembourg 15; France 3.
Tin—long tons	1	1	All from France.
Zinc	31	6	France 5.
Nonmetals:			
Cement, lime, and other building materials.	48,439	60,298	West Germany 13,679; France 11,141; Rumania 9,003.
Clay construction materials	539	336	France 142; West Germany 127.
Fertilizers, manufactured	245	181	France 60; West Germany 59.
Stone, sand and gravel	68	63	Italy 29; Spain 20; France 14.
Sulfur and pyrite	5	------	
Nonmetallic minerals, crude unspecified.	7,080	6,955	Spain 5,052; Senegal 1,189.
Nonmetallic mineral, manufactures.	45	61	France 50; West Germany 7.
Mineral fuels:			
Coal, coke and briquets	26	60	Dahomey 40; France 20.
Gas, natural and manufactured	161	187	Spain 64; Spanish African possessions 42.
Petroleum refinery products	45,988	61,026	Venezuela 16,542; Iraq 13,457; Curacao 9,083.
Tar, pitch and other crude chemicals from coal, oil, and gas distillation.	107	138	France 112; United Kingdom 15.

r Revised. NA Not available.

[1] Includes unwrought and semimanufactures unless otherwise specified.

Source: Statistical Office of the European Community, No. 4, 1966, pp. 85–105; and No. 4, 1967, pp. 91–105.

UPPER VOLTA

There was no active mineral industry in the Republic of Upper Volta in 1967. Gold mining ended in 1966; remaining mineral operations contributed little to the GNP, estimated at $275 million in 1967. Future mineral development in Upper Volta focuses on manganese and, to a lesser extent, on limestone.

PRODUCTION AND TRADE

No gold has been produced commercially since 1966. Gold production for recent years was as follows, in troy ounces: 1963, 44,786; 1964, 32,665; 1965, 32,504; 1966, 16,075.

Upper Volta's principal mineral exports

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in 1966, as in the past, were crude gold and gold-bearing materials. Major mineral imports continued to be petroleum refinery products ($2.2 million in 1966; $1.5 million in 1965); cement, lime, and other building materials, ($0.9 million in 1966; $1 million in 1965), and iron and steel semimanufactures, ($0.9 million in 1966; $1.4 million in 1965). Values for mineral and total trade were as follows:

	Value (thousands dollars)		Mineral commodities' share of total (percent)
	Mineral commodities [1]	Total trade	
Exports:			
1965	198	14,909	1.3
1966	257	16,145	1.6
Imports:			
1965	4,748	37,145	12.8
1966	5,044	37,648	13.4
Trade balance:			
1965	−4,550	−22,236	XX
1966	−4,787	−21,503	XX

XX Not applicable.
[1] Values given are for only those commodities listed in table 44 of this chapter.

Table 44.—Upper Volta: Foreign trade in selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965 [1]	1966 [2]	Principal sources or destinations, 1966
Exports:			
Metals:			
Aluminum	6	--------	
Iron and steel:			
Scrap	432	298	Ivory Coast 270; Mali 28.
Semimanufactures	28	28	Mali 24.
Nonferrous ore and concentrate, mainly gold.	548	488	Sweden 361; Ivory Coast 126.
Nonmetals:			
Cement, lime and other building materials.	12	--------	
Clay construction materials	------	4	NA.
Nonmetallic minerals, crude unspecified.	16	--------	
Mineral fuels:			
Petroleum refinery products	3	54	Ivory Coast 35; Niger 15; Mali 4.
Imports:			
Metals:			
Aluminum	91	98	Ivory Coast 70; Ghana 19.
Copper	8	6	All from France.
Iron and steel:			
Scrap	521	380	Ghana 213; United Kingdom 114.
Semimanufactures	6,845	4,364	France 3,779; Belgium-Luxembourg 464.
Lead	5	4	France 4.
Zinc	1	1	France 1.
Nonmetals:			
Abrasives, natural	1	5	France 5.
Cement, lime, and other building materials.	28,542	23,216	France 8,508; Belgium-Luxembourg 8,283; Senegal 2,702.
Clay construction materials	270	324	West Germany 155; Italy 84; France 56.
Fertilizers, manufactured	519	559	France 437; West Germany 92; Tunisia 30.
Sulfur and pyrite	8	6	France 6.
Nonmetallic minerals, crude	7,809	10,557	Senegal 7,506; Mali 1,144; Algeria 757.
Nonmetallic minerals, manufactured	22	66	Ivory Coast 35; France 28.
Mineral fuels:			
Coal, coke and briquets	12	--------	
Petroleum refinery products	36,759	34,964	Ivory Coast 31,804; France 948; Venezuela 924.
Gas, natural and manufactured	225	239	Ivory Coast 203; France 36.
Tar, pitch and other crude chemicals from coal, oil and gas distillation.	5	6	France 4.

NA Not available.
[1] Statistical Office of the European Communities. No. 10, 1967, pp. 103–115.
[2] Statistical Office of the European Communities. No. 8, 1967, pp. 75–89.

COMMODITY REVIEW

Metals.—*Gold.*—Gold mining stopped in March 1966. The mining company, Société des Mines de Pours, operated at a loss since about 1963. More than 600 Africans had been employed at the mine.

Manganese—Late in 1967 the Government and the United Nations Special Fund began studies on the feasibility of

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building a 350-kilometer railroad to the Tambao manganese ore deposit. The Government also applied to the World Bank for financial assistance to build the railroad. The Tambao deposit is to be developed by Overseas Mineral Resources Development Corp., a semigovernmental Japanese firm. African Manganese Corp. of London, subsidiary of Union Carbide Corp., became a partner in the venture in 1967.

Proved reserves at Tambao total 6.9 million tons; another 2 or 3 million tons probably can be established by further testing. The manganese content of the reserves is as follows: 1.2 million tons at 46 to 48 percent; 2.5 million tons at 48 to 54 percent; and 3.2 million tons at 54 to 60 percent. The ore contains 2 to 3 percent iron, 8 percent silica, and 0.15 to 0.18 percent phosphorus. Strip mining has been suggested as the best development method.

Nonmetals.—*Limestone.*—Two limestone deposits were found by United Nations teams investigating the area along the Beli River at Tin Hassan, about 32 kilometers west of Tambao. The largest of the two deposits, on the north bank of the river, contains an estimated 24 million tons. The smaller, on the south bank, is more accessible and contains an estimated 6.8 million tons, most of which consists of 45 percent lime with less than 2.3 percent magnesium oxide. Studies are to be made to determine if a road or railroad could be built to the deposit. If so, there might be some justification to build a cement plant; sand and clay are available near the deposit.

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The Mineral Industry of Other Arabian Peninsula Areas

By David A. Carleton [1]

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BAHRAIN

Petroleum refining and crude oil production remained the principal industrial activities of Bahrain and the only significant mineral industry activity. Income from petroleum operations which amounted to $30 million in 1967 provided more than half the gross national product and about 85 percent of Government revenues. The increase in revenues from an estimated $22 million in 1966 reflects a rise in crude oil production, an increase in Government receipts per barrel, and an increase in payments from Abu Safah field production. (Revenue from this field in Saudi Arabia's offshore area is shared by the two countries.) In 1967 the petroleum industry employed 5,340 persons, 4,600 of whom were Bahrain nationals.

PRODUCTION

Bahrain Petroleum Co. (BAPCO) which holds a concession to the onshore area is the country's only crude oil producing company and owns the only refinery. Crude oil output reached a record high in 1967, averaging 65,509 barrels per day, up 7 percent from the 1966 level. Modifications at gathering facilities and the installation of new equipment at Bahrain's only oilfield contributed to the improved rate of production.

Throughput at the BAPCO refinery, which processes all domestic production and crude imported from Saudi Arabia, also established new records in 1967. It averaged 244,292 barrels per day that year, an increase of more than 21 percent compared with that of 1966. This achievement was made possible by the improvement of processing units such as the conversion of a thermal reformer to a 7,000 barrel-per-day hydrodesulfurizer and the expansion of jet fuel production facilities.

[1] Supervisory foreign mineral specialist (petroleum), Division of International Activities.

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Table 1.—Bahrain: Production of crude petroleum and petroleum refinery products

(Thousand 42-gallon barrels)

Commodity	1963	1964	1965	1966	1967
Crude petroleum	16,503	18,000	20,788	22,521	25,370
Petroleum refinery products:					
Gasoline and naphtha	16,361	16,704	14,876	14,505	16,817
Jet fuel	5,138	6,580	8,431	9,456	13,407
Kerosine	4,228	3,469	3,171	2,763	2,304
Distillate fuel oil	19,804	15,764	12,772	12,777	13,963
Residual fuel oil	33,362	27,682	27,534	29,479	37,844
Other	187	740	887	265	811
Total	79,080	70,939	67,621	69,245	85,146
Refinery fuel and loss	5,608	8,361	6,737	4,233	4,020

TRADE

Petroleum exports, estimated to be $225 million in 1967, were the major export of Bahrain. Bunkers were worth another $16 million. Based on posted prices crude oil imported from Saudi Arabia was valued at $110 million. The economy of Bahrain, which is based upon petroleum and upon the country's position as a trading center in the lower Persian Gulf area, made a modest recovery after several years of stagnation. Improved business resulted from an increase in offshore oil operations in the Persian Gulf. The future, however, is clouded by the scheduled withdrawal of British troops from Bahrain by 1971 and by the growing preference in neighboring States for direct importation. Total imports in 1967 were estimated at $95 million, of which $1.6 million was for cement and $2.4 million for iron and steel semimanufactures. Excluding petroleum, total exports and reexports in 1967 were estimated to be $22 million, of which about $0.5 million were for mineral commodities.

Table 2.—Bahrain: Exports and reexports of mineral commodities

(Thousand 42-gallon barrels unless otherwise specified)

Commodity	1965	1966	1967 [1]
Metals: Iron and steel [e] metric tons	250	600	900
Nonmetals: Cement [e] do	2,000	700	1,300
Mineral fuels:			
Petroleum refinery products:			
Gasoline and naphtha	14,836	14,393	16,577
Jet fuel	8,310	9,597	13,152
Kerosine	3,244	2,902	2,353
Distillate fuel oil	12,222	13,146	12,562
Residual fuel oil	21,625	22,819	29,559
Other	827	596	667
Total	61,064	63,453	74,870
Bunkers, distillate fuel oil	269	267	404
Bunkers, residual fuel oil	5,741	6,197	7,827

[e] Estimate.
[1] Data on principal destinations not available.

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Table 3.—Bahrain: Imports of mineral commodities

(Thousand 42-gallon barrels unless otherwise specified)

Commodity	1965	1966	1967 [1]
Metals: Iron and steel [e] thousand metric tons	15	10	12
Nonmetals: Cement [e] do	80	95	80
Mineral fuels:			
Crude petroleum	50,025	49,412	62,445
Petroleum refinery products:			
Gasoline and naphtha	1,178	1,718	1,441
Kerosine	------	--------	212
Residual fuel oil	------	--------	103
Lubricants	11	8	10
Other	------	--------	17
Total	1,189	1,726	1,783

[e] Estimate.
[1] Data on principal sources not available except for crude oil, all of which was imported from Saudi Arabia.

COMMODITY REVIEW

Mineral Fuels.—*Petroleum and Natural Gas.*—No exploration wells were drilled during 1967; however, seismic reflection surveys were carried out onshore by BAPCO and offshore by Continental Oil Co., which has an 880,000-acre concession. Studies by these companies to determine future exploration were in progress at yearend. At that time proved oil reserves, all onshore, were down to 195 million barrels from 200 million barrels the previous year; nonassociated gas reserves totaled 100 billion cubic feet.[2]

A program to more precisely delineate the Bahrain oilfield continued in 1967 with the drilling of six development wells. At the end of the year Bahrain oilfield had 199 oil wells, five gas wells, four gas injection wells, and 12 awaiting further development.

QATAR

Petroleum is essentially the only developed mineral resource of Qatar, and practically all Government revenues and foreign exchange resources are derived from petroleum operations. All petroleum industry activity in 1967 continued to be carried out by private foreign companies which during the year paid the Government in the form of royalties and taxes an estimated $110 million, up from $90 million in 1966. Oil revenues averaged an estimated $0.95 per barrel produced, up from $0.85 in 1966. This increase reflects primarily the reduction and temporary elimination of the discount of posted prices previously allowed the companies in computing their income taxes. Although petroleum operations were curtailed for several days during the Arab-Israeli conflict in June 1967 overall annual operations expanded.

Reserves at yearend were reported[3] to be 3,750 million barrels of crude oil and 7,500 billion cubic feet of associated natural gas. Nearly all of the natural gas produced in solution with the crude oil is flared, vented, or otherwise wasted. At yearend work was nearing completion on a 300-ton-per-day cement plant.

PRODUCTION AND TRADE

Crude oil production increased significantly for the second year in a row, as a result of expanded offshore Persian Gulf output. All of the offshore production was exported, and except for a very small amount run to the Umm Said topping plant, all of the onshore production was exported. Based on partial 1966 data, principal areas of destination for crude oil exports were Western Europe, 30 percent; Asia and the Far East, 19 percent; Africa, 11 percent; and Oceania, 9 percent.

There are no trade data available on mineral commodities other than petroleum. Limited information suggests that the value of all imports into Qatar in 1967

[2] Oil and Gas Journal. V. 65, No. 52, Dec. 25, 1967, p. 118.
[3] Oil and Gas Journal. V. 65, No. 52, Dec. 25, 1967, p. 118.

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has increased to between $30 and $40 million due to increased development schemes undertaken. An estimated 10 to 20 percent of total imports was accounted for by petroleum products, iron and steel semimanufactures, cement, and other construction materials.

Table 4.—Qatar: Production of crude petroleum and petroleum refinery products

(Thousand 42-gallon barrels)

Commodity	1963	1964	1965	1966	1967
Crude petroleum	70,158	77,885	84,215	105,945	118,083
Petroleum refinery products: e					
Gasoline	51	59	64	60	64
Kerosine	27	32	35	36	35
Distillate fuel oil	47	50	56	50	57
Residual fuel oil	61	------	------	------	
Other	4	4	------	------	80
Refinery fuel and loss	NA	73	75	75	

e Estimate. NA Not available.

Table 5.—Qatar: Exports and imports of petroleum and refinery products [1]

(Thousand 42-gallon barrels)

Commodity	1964	1965	1966	1967
Exports: Crude petroleum	77,510	83,354	105,724	116,829
Imports, e Petroleum refinery products:				
Gasoline	96	90	100	
Kerosine	30	30	35	
Distillate fuel oil	35	35	35	194
Lubricants, including grease	6	6	7	

e Estimate.
[1] Data on principal destinations and sources not available.

COMMODITY REVIEW

Mineral Fuels.—*Petroleum.*—Production from the only onshore field, the long established Dukhan field, operated by Qatar Petroleum Co. (QPC), averaged 194,518 barrels per day in 1967, a level essentially unchanged since the early 1960's. The two secondary recovery operations in this field, a miscible gas injection plant and a pilot water injection scheme, have experienced operational difficulties; both were shutdown for repairs during much of the year. Drilling involved only one workover well. At the beginning of 1967 QPC had 1,433 employees.

Shell Oil Co. of Qatar, Ltd. continued to develop offshore holdings by drilling five wells (two dry) in Maydam Mahzam field and one well (drilling at yearend) in Idd-el-Shargi field. The aggregate footage was 34,601. Production by these two fields during the last quarter of 1967 averaged about 151,000 barrels per day, of which 72 percent was from Maydam Mahzam. Increased production in 1966 and 1967 was facilitated by the completion of storage and loading facilities on Halul Island. The temporarily moored tanker which had been used for storage was returned to normal tanker service.

Continental Oil Co. of Qatar, Ltd. and Union Oil Co. of California have jointly drilled four unsuccessful wells in a 5.7-million-acre concession which covers both onshore and offshore areas. One offshore well encountered noncommercial oil shows at a depth of 9,760 feet.

TRUCIAL STATES

Petroleum is the only mineral produced in significant quantities in the Trucial States, a group of sheikhdoms consisting of Abu Dhabi, Dubai, Sharjah, Ajman, Umm al-Qaiwain, Ras-al Khaimah, and Fujairah. During the latter part of 1967,

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several informal talks were held to consider the possible formation of a political federation to include these seven sheikhdoms, Bahrain, and Qatar. Petroleum production has been limited to onshore and offshore Abu Dhabi; an offshore Dubai field is being developed for production in 1969.

The direct payments of oil industry continue to be the greatest source of revenue in the Trucial States. In Abu Dhabi, 1967 revenue from petroleum production and exports was $80.1 million,[4] a significant amount for an area with a population of only 25,000 to 30,000. This area and other sheikhdoms also received oil concession bonus payments amounting to several million dollars. Concession terms for oil production both onshore and offshore were modified in 1966 to conform to the 50-50 profit-sharing principal prevailing in other Near East countries. In 1967 Abu Dhabi was admitted to the Organization of Petroleum Exporting Countries (OPEC).

Oil revenues and oil industry expenditures have had a marked impact on the economy of the Trucial States. Construction and other commercial activity have increased, including the implementation of development projects such as roads, housing, ports, powerplants, desalinization units and water distribution systems. Government development spending for Abu Dhabi was estimated at $60 million in 1967 and is expected to be twice that in 1968.

PRODUCTION

Although small unreported quantities of clay and mud for bricks, other construction materials, and salt are produced and consumed locally, crude petroleum is the only significant mineral commodity produced in the Trucial States. In 1967, onshore and offshore production from Abu Dhabi averaged 380,000 barrels per day, 4 percent of Middle East output. The 6-percent increase over 1966 was the result of the rise in offshore production.

Table 6.—Trucial States and Muscat and Oman: Production and imports of crude petroleum and petroleum refinery products

(Thousand 42-gallon barrels)

Commodity	1963	1964	1965	1966	1967 [1]
Production: [2]					
Crude petroleum	17,571	67,465	102,804	131,531	162,497
Imports:					
Petroleum refinery products: [e]					
Gasoline	120	160	170	200	220
Kerosine	25	20	20	20	25
Distillate fuel oil	130	190	200	220	250
Lubricants	6	8	8	8	10

[e] Estimate.
[1] Data on principal sources not available.
[2] All Abu Dhabi production, except 23,030,000 barrels produced in Muscat and Oman in 1967.

TRADE

Mineral trade consisted primarily of crude oil exports, gold and silver transshipments at Dubai, and imports of refined petroleum products and construction materials. Based on posted prices, crude oil exports during the year were valued at an estimated $260 million. It has been estimated[5] that $150 to $200 million worth of gold was trafficked through Dubai in 1967 mainly to India and that an estimated 250 long tons of silver were transshipped from Dubai to Western Europe, mostly in payment for the gold.

COMMODITY REVIEW

Mineral Fuels.—*Petroleum.*—Abu Dhabi was the scene of much oil exploration and production activity in 1967; however, most of the increase in production resulted from the completion of offshore pipeline and handling facilities in 1966. The principal development in the offshore concession of Abu Dhabi Marine Areas, Ltd. (ADMA) was Zakum oilfield which came on stream during November 1967. Pro-

[4] OPEC Bulletin, No. 4, April 1968, p. 2.
[5] Wall Street Journal. V. 171, No. 39, Feb. 26, 1968, p. 1; World Petroleum. V. 38, No. 7, July 1967, pp. 46, 70.

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duction of the field was initially 120,000 barrels per day; plans call for output to reach 200,000 barrels per day in 1969. Crude from the field is transported by 90-kilometer, 30-inch-diameter submarine pipeline to Das Island where a new loading berth capable of handling tankers up to 200,000 deadweight tons is nearing completion. When completed in early 1968, loading and other facilities on Das Island will be capable of handling 320,000 barrels per day. Until Zakum field came on stream, Umm Shaif was the only offshore Abu Dhabi field; together their production averaged an estimated 122,000 barrels per day. There has been no reported development of El Bunduq field, a 1964 offshore discovery.

In December, 1967 the Government granted to a consortium of three Japanese companies an offshore concession in two areas totaling 1.2 million acres which were relinquished by ADMA in January 1967.

Output from Murban and Bu Hasa, the two onshore producing fields of Abu Dhabi Petroleum Co. (ADPC), fell slightly in 1967, averaging about 258,000 barrels per day. The shut-in Abu Jidu field, a 1964 discovery of ADPC, does not appear to have the potential of the other onshore fields.

Two onshore concession areas totaling more than 3.5 million acres which were relinquished by ADPC in October 1965 were awarded in January 1967 to a group of companies consisting of Phillips Petroleum Co., Ente Nazionale Idrocarburi (ENI), and American Independent Oil Co. Preliminary surveys commenced in 1967. Three other onshore areas totaling 1.8 million acres relinquished by ADPC during the year were opened by the Government for concession bids.

Proved reserves at Abu Dhabi were estimated[6] at 15 billion barrels of crude oil and 8 trillion cubic feet of associated natural gas at yearend.

Dubai is expected to be the second oil producing Trucial State. A 1966 discovery well and two 1967 step-out wells have confirmed the existence of commercial crude oil reserves in two reservoirs in the offshore Fateh field. The first production platform is under construction and production is expected in the second quarter of 1969. The field which is 96 kilometers from the shoreline is in an 830,000-acre-offshore concession; Dubai Marine Areas, Ltd. with a 50-percent interest is the concessionaire of record and Dubai Petroleum Co., a wholly owned subsidiary of Continental Oil Co., with a 35-percent interest is the operator. Continental Oil Co., is also drilling the first onshore Dubai exploration well on a 914,000-acre-concession in which Dubai Petroleum Co. has a 55-percent interest and is the operator and concessionaire of record.

In Sharjah, Ajman, and Umm al-Qaiwain, the entire offshore and onshore concession held by John W. Mecom and shared with Union Oil Co. of California was terminated when the concession expired September 27, 1967. During the 5 years of the concession two unsuccessful wells were drilled. One, an onshore well in Sharjah near the Dubai border proved noncommercial shows and was finally abandoned at about 15,000 feet. The offshore Umm al-Qaiwain well was abandoned in February when a severe storm damaged drilling apparatus. The three sheikhdoms are now open for concession bids.

In Ras-al Khaimah the 401,280-acre onshore section of the Khaima Oil Co. (80 percent Union Oil Co. of California and 20 percent Southern Natural Gas Co.) was relinquished, and in October the area was opened for offers by interested groups. Khaima Oil Co. which presumably still holds the offshore areas of Ras-al Khaimah has drilled one 12,845-foot dry well since 1964 when it was granted the concession covering all onshore and offshore areas.

Bochumer Mineralöl G.m.b.H. and Co. (Bomin), an independent West German firm which received an oil concession for the onshore and offshore areas of Fujairah in mid-1966, performed preliminary geophysical surveys during 1967.

[6] Oil and Gas Journal. V. 65, No. 52, Dec. 25, 1967, p. 118.

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MUSCAT AND OMAN

No data are available on the minerals industry of Muscat and Oman except for the petroleum industry. Regular production and exports of crude oil began in August 1967. By the end of the year 23,030,000 barrels had been produced by Petroleum Development Oman, Ltd. (PDO), and the production rate had reached 170,000 barrels per day. The crude has a low sulfur content and averages 32° API. Fahud field accounted for 84 percent of 1967 production and Natih field, the remainder. A third field, Yibal, was being readied for production by late 1968.

During the year PDO performed 65 party months of geophysical and geological survey, and at yearend one well was being drilled. The 50 wells drilled in Muscat and Oman include 22 producing (Fahud, 15 and Natih, 7), 14 shut-in, and 14 in other categories. The crude oil produced is carried via a 30/36-inch, 280-kilometer pipeline to the port of Mina al Fahal (formerly Saih al Maleh) near Muscat where tankers up to 200,000 deadweight tons are able to berth at an offshore mooring.

PDO concluded a new agreement with the Sultan in 1967 which conforms to the 50-50 profit-sharing principal with royalty expensing according to the OPEC formula. Oil revenue for the Sultanate should reach $20 to $25 million annually in the near future. During the year Compagnie Française des Pétroles purchased a 10-percent interest in PDO from Partex Corp. (Gulbenkian estate) which now owns 5 percent; the remaining 85-percent participation is held by the Royal Dutch/Shell Group. The Sultanate applied for membership in OPEC during 1967.

A group of West German private petroleum interests which received a 3.3-million-acre concession offshore Muscat and Oman in the Gulf of Oman in 1966, carried out geophysical surveys in 1967 preparatory to a drilling program to be launched in 1968. The group is headed by Wintershall A. G. which holds a 65 percent interest.

Union Oil Co. of California and Continental Oil Co. relinquished their shares of a concession in the Dhofar area held jointly with John W. Mecom. Mecom's rights were scheduled to expire in January 1968.

SOUTHERN YEMEN

The People's Republic of Southern Yemen, which was established in November 1967 after the withdrawal of British troops from the former Federation of South Arabia, is now a political union composed of Aden and the former Aden Protectorates.

Modern industry is confined to Aden where BP Refinery (Aden), Ltd., has a 166,000-barrel-per-day refinery which imports crude oil to produce refined products primarily for bunkering and export. In 1966 and 1967 the gross value of refinery output was an estimated $140 million and $120 million, respectively. The drop reflects a curtailment of refining as well as the devaluation of the pound. In late 1967, there were 1,900 persons employed in petroleum refining and 560 in bunkering. In the only other significant mineral industry, about 80 persons were employed at facilities producing salt by solar evaporation of sea water.

The newly independent country has been beset with economic difficulties resulting from the British withdrawal and from closure of the Suez Canal since June 1967. The British Government provided Southern Yemen financial assistance that is to continue at least through May 1968. This will help compensate for the revenues lost due to the curtailment of shipping at Aden, a free port normally with a large entrepôt trade.

PRODUCTION AND TRADE

The refinery at Aden operated below capacity during mid-1967 due to civil strife and reduced bunker demand. In November the refinery owners agreed to refine up to 200,000 long tons per month (approximately 48,000 barrels per day) of Egyptian crude oil. The Egyptian public petroleum company, Egyptian General Petroleum Corp. contracted to deliver the crude from the Gulf of Suez and to handle the offtake of products. Average throughput of the refinery in 1967 was 117,510 barrels per day compared with 139,950 barrels per day in 1966.

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Petroleum imports in 1966 were valued at $110.7 million (including $92.5 million for crude oil) representing 39 percent of all imports into the country. Principal sources of petroleum imports are Iran, 32 percent; Kuwait, 30 percent; and Abu Dhabi, 17 percent. That year exports of refined products (including ships' bunkers) totaled $149.1 million or 78 percent of all exports. The increased construction of super tankers which are unable to transit the Suez Canal in cargo is expected to have a deleterious effect on Aden's economy.

The Indo-Aden Salt Co. continued to produce salt in open pans at Aden. Depressed market conditions suppressed production and exports in 1965. Most exports went to Japan and East Africa.

Table 7.—Southern Yemen: Production of mineral commodities

Commodity	1963	1964	1965	1966	1967 e
Nonmetals: Salt---metric tons	86,360	81,280	72,481	72,283	60,000
Mineral fuels, Petroleum refinery products:					
Gasoline---thousand 42-gallon barrels	3,463	3,393	3,428	4,245	4,000
Jet fuel and kerosine---do	5,430	6,112	5,448	5,856	5,000
Distillate fuel oil---do	9,356	9,479	9,280	9,221	9,000
Residual fuel oil---do	25,327	23,584	24,991	23,832	20,000
Other, mostly naphtha---do	3,262	4,083	4,354	4,377	2,000
Refinery fuel and loss---do	2,574	3,252	3,714	3,550	3,000
Total---do	49,412	49,903	51,215	51,081	43,000

e Estimate.

Table 8.—Southern Yemen: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	1967 [1]
Metals: Iron and steel	257	330	NA
Nonmetals:			
Cement	4,663	4,213	NA
Salt	48,889	75,425	NA
Mineral fuels:			
Coal	------	20	NA
Petroleum refinery products:			
Gasoline---thousand 42-gallon barrels	3,161	3,953	NA
Kerosine and jet fuel---do	4,795	5,164	NA
Distillate fuel oil---do	7,033	7,150	NA
Residual fuel oil---do	11,341	7,555	NA
Other, including LPG and feedstocks---do	5,732	4,377	NA
Total---do	32,062	28,199	NA
Bunkers---do	22,272	24,809	10,531

NA Not available.
[1] Data on principal destinations not available.

Table 9.—Southern Yemen: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	1967
Metals: Iron and steel	13,267	8,514	NA
Nonmetals: Cement	112,188	73,494	NA
Mineral fuels:			
Crude petroleum---thousand 42-gallon barrels	51,772	51,276	e 43,000
Petroleum refinery products:			
Gasoline---do	803	777	NA
Kerosine and jet fuel---do	71	------	NA
Distillate fuel oil---do	667	741	NA
Residual fuel oil---do	5,982	6,695	NA
Lubricants e---do	12	12	NA
Total---do	7,535	8,225	NA

e Estimate. NA Not available.

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COMMODITY REVIEW

Mineral Fuels.—*Petroleum.*—There have been no major additions to the Aden refinery since the distillation capacity was raised from 150,000 to 166,000 barrels per day in 1966. The 70,000-acre oil exploration concession held by a subsidiary of Standard Oil Co. (Indiana) was relinquished in 1966 after 3 years of exploration and four dry holes. Southern Yemen has invited bids for a new concession and by yearend 1967, a few U.S. companies had expressed interest.

YEMEN

The most significant mineral industry development in Yemen since 1965 was the resumption in January 1966 of the production and exportation of rock salt after nearly 2 years' suspended operations. Although rock salt is the only major developed mineral resource, preliminary reports from exploration carried out by an Egyptian scientific team reveal occurrences of coal, copper, sulfur, and iron ore in unmeasured quantities. Construction of a cement plant at Bajil was scheduled to begin in March 1967; however, the present status of this project is unknown. The plant was to be built with Soviet financial and technical assistance. There has been no petroleum exploration activity in Yemen for several years; Government officials have expressed an interest in discussing possible concession terms with foreign companies.

Small quantities of gypsum, asbestos, and building materials are produced for local consumption; however, data on output are not reported. The Salif Salt Co., a joint venture of the Governments of Yemen and the United Arab Republic, completed repairs to existing mining equipment at Salif which had been in disuse since 1964 when a 5 year contract with Japanese interests was terminated. Estimated salt production during recent years was as follows:

Year	Metric tons
1962	150,000
1963	100,000
1964	35,000
1965	-------
1966	r 85,000
1967	100,000

r Revised.

Japan received 80,213 and 101,983 tons of rock salt from Yemen in 1966 and 1967, respectively. The c.i.f. value in Japan for these imports was $0.9 and $1.1 million, respectively.

Principal minerals imported into Yemen were petroleum products, building materials, including iron and steel and cement. Together they have a c.i.f. value equal to 18 percent of officially reported imports, which in 1965 were valued at $25.8 million. Petroleum imports were valued at $2.6 million in 1965, the latest year for which data were reported.

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The Mineral Industry of Other Far Eastern and South Asian Areas

By Taber de Polo,[1] Arnold M. Lansche,[1] and Ronald A. Pense [2]

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AFGHANISTAN [3]

The economy of Afghanistan continued in the same state of general sluggishness experienced in 1966; preliminary data indicated declines in export earnings, imports, and Government revenues. Beginning late in 1967, export of natural gas to the U.S.S.R. resulted in some improvement but this had little effect on the overall economy because proceeds went to servicing the country's growing debt to the U.S.S.R.

Cement, coal, and salt continued to be the only mineral commodities produced commercially for domestic consumption, and small quantities of lapis lazuli were mined for export. Interest was shown in iron ore, chromite, beryl, copper, lead, and zinc; feelers were extended for possible foreign aid to do feasibility studies and for assistance in developing these minerals. However, activity will be hindered by inadequate transportation and capital. Continued interest was also shown in improving and expanding the coal mining industry, possibly with United States aid; petroleum exploration with Soviet aid; cement production expansion with Czechoslovakian aid; and surveys of copper, lead, and zinc potential with West German aid.

The new investment law, passed on March 26, 1967, encourages joint ventures by foreign and Afghan capital. Complete foreign ownership is not excluded. Incentive features of the new law included 5-year exemption from income taxes, import duties on essential raw materials, and dividend taxes and a 10-year exemption on export duties.

The third 5-year plan which goes into effect on March 22, 1968, calls for investments of the equivalent of US$550 million, 90 percent from foreign capital. One-third of the new investment is to be allocated to mines and industry.

Installed electric power capacity of 72,000 kilowatts at the end of 1967 is scheduled to be doubled within the next year by completion of the U.S.S.R. financed powerplant at Naghly near Kabul and West German financed plant at Mahipar.

PRODUCTION

The only significant advance in mineral output in 1967 was the commencement of natural gas production. Output of most other mineral commodities in 1967 was probably close to 1966 levels. Estimated value of listed mineral production in 1966 increased from the equivalent of $6.98

[1] Physical scientist, Division of International Activities.
[2] Research specialist, Division of International Activities.
[3] Prepared by Taber de Polo.

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million in 1965 to $7.8 million. In addition to commodities listed, small quantities of clays, gypsum, talc, limestone, and marble were produced and consumed locally, but data on tonnages are lacking.

Table 1.—Afghanistan: Production of metals and minerals

Commodity [1]		1963 [2]	1964 [2]	1965 [2]	1966	1967
Metals:						
Beryl	kilograms	-----	500	-------	-------	-------
Nonmetals:						
Barite	metric tons	1	2	e 2	-------	-------
Cement	thousand metric tons	95	e 125	170	175	130
Lapis lazuli	kilograms	5,421	5,000	8,550	10,030	5,179
Salt:						
Rock	thousand metric tons	21	13	18	20	31
Other	do	12	12	20	18	-------
Total	do	33	25	38	38	31
Mineral fuels: [3] Coal:						
Bituminous	do	98	113	r 132	141	152
Briquets	do	e 20	e 20	e 14	r 21	NA

e Estimate. r Revised. NA Not available.
[1] In addition to commodities listed, Afghanistan produces construction materials such as clays, stone, and sand and gravel, but data on production levels are not available.
[2] Data for Afghan calendar year beginning March 21.
[3] Production of natural gas began in November 1967 and output reached 18,400 million cubic feet by the end of fiscal year.

TRADE

Afghanistan's mineral commodity exports showed a significantly different pattern late in 1967 as pipeline shipments of natural gas to the U.S.S.R. began. Previously the only mineral export had been lapis lazuli. Dependence on imports continued for petroleum products, metals, and most nonmetallics. The latest available data indicated the value of mineral imports as the equivalent of $8.3 million in the year ending March 20, 1965.

Table 2.—Afghanistan: Imports of petroleum refinery products

(Thousand 42-gallon barrels)

Commodity	1964–65 [1]	1965–66 [1]	Principal sources, 1965–66
Gasoline	913	962	U.S.S.R. 805; Iran 70.
Kerosine	153	142	U.S.S.R. 142.
Diesel fuel oil	416	507	U.S.S.R. 336; Pakistan 112.
Lubricants and other.	46	49	U.S.S.R. 29, United States 8.

[1] Afghan calendar year beginning Mar. 21.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—Interest continued in the 2 billion ton Hajigak hematite deposit 138 kilometers northwest of Kabul. Various development plans were being considered. In January 1967 the Swindell–Dressler Co. released an evaluation report favorable to natural gas reduction of the Hajigak iron ore.

Lead and Zinc.—On August 20, 1967, a minerals survey agreement was signed between the Afghan Ministry of Mines and Industries and Bergbau Planning G.m.b.H. of Essen, West Germany. Assisted by a West German fiancial grant, a detailed study of the deposits, including mining and processing techniques, transport needs, and the market for lead and zinc in the vicinity of Tolak in northern Afghanistan will be conducted.

Nonmetals.—*Cement.*—On July 20, 1967, there was an agreement between the Afghan Government and a Czechoslovakian organization to make a detailed feasibility study for a new cement plant at Herat. The need for cement in Afghanistan is greater than the installed capacity of the two existing plants—one at Ghouri and the other at Jabal-i-Seraj.

Mineral Fuels.—*Coal.*—In 1967 most production continued to come from the Karkar mine, with lesser quantities from the Ishpushta and Darra-i-Suf mines, all Government owned. In July 1967 there were 600 underground and 175 surface

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employees at the Karkar, with a reported production average about 300 tons per day. The bulk of the output continued to go to the Pul-i-Khumri cement plant which requires about 150 tons per day. The Ishpushta has limited capabilities for production and reserves are limited here and at Karkar, so there was renewed interest by the Ministry for long-range planning to develop the Darra-i-Suf mine where reserves have been estimated at upward of 60 million tons, with an additional reported 25 million tons at Shaba-Shak, 16 kilometers to the east.

Petroleum and Natural Gas.—During the last 2 months of 1967, 76 million cubic feet of natural gas were delivered to the U.S.S.R. from the Khwaja Gogirdak and Yatim Tagh fields in the Shibarghan area 530 kilometers north of Kabul. This first delivery was a trial run for an 18-year gas export plan calling for 53 billion cubic feet per year to be delivered to the U.S.S.R. by the Afghan Government in partial payment for Soviet financial and technical aid in development of Afghan natural gasfields and other projects. Work continued on three 99-kilometer pipelines (two each of 426 and one of 720 millimeters diameter) from the Shibarghan area fields, under the Oxus (Amu) river to Dushombe, U.S.S.R. Branch lines within Afghanistan will deliver gas to a urea plant at Balkh (Wazirabad) and to an electric powerplant near Mazar-i-Sharif. Reserves in these fields have been estimated at 2,400 billion cubic feet at the 1,600-meter level and an additional 7 to 10.5 billion feet at 2,300 plus meters. Preparation work for drilling near Kunduz/Khanbal was 30 percent complete at yearend and drilling on the first well 16 kilometers west of Chuga was scheduled to begin in 1968. Other promising structures were reported at Yalanghack, Anhoi, Sur-i-pal (Sulankat, Kwaza-Gougwer and Gatim Dagh), and Andkhoi (Aska) areas.

Exploration was to continue under the control of the Government Petroleum Prospecting Department with assistance of Soviet and Swedish engineers, with inital emphasis in the Paktia area where it was reported that one oil well produced 70 to 100 barrels per day.

CAMBODIA [4]

Cambodia continued to produce relatively minor quantities of gold, phosphate rock, limestone, precious and semiprecious stones, salt, cement, and simple construction materials, but the mineral industry contributed little to the country's gross national product, estimated at roughly $875 million [5] in 1966.

Generation capacity for electric power was being sharply expanded primarily by the installation of hydroelectric plants. A large project at Kirirom (Kompong Spew) and another at Kanchay (Kampot) are both scheduled for completion in 1969.

Teams of geologists from France, the United Nations, and mainland China have explored the country and found a few deposits of iron, zinc and lead, gold, phosphates, bauxite, manganese, and limestone. Potentials generally have not been evaluated.

PRODUCTION

Although official production data were not available at the time of writing, Cambodia's mineral output in 1967 probably showed no changes from the insignificant levels of 1966.

[4] Prepared by Arnold M. Lansche.
[5] In 1967, the official exchange rate was 35 riels equal US$1, and the Hong Kong open market rate varied between 7.74 and 77.60 riels per US$1.

Table 3.—Cambodia: Production of metals and minerals [1]

Commodity		1963	1964	1965	1966	1967
Metals:						
Gold	troy ounces	6,687	e 6,000	e 4,500	e 4,000	NA
Nonmetals:						
Cement	thousand metric tons	-----	e 10	e 50	59	e 60
Salt	do	60	e 60	NA	NA	NA
Phosphate rock	metric tons	150	150	150	-------	NA

e Estimate. NA Not available.
[1] In addition to commodities listed, gem stones are produced in undetermined quantities.

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Table 4.—Cambodia: Imports of selected metals and minerals

(Metric tons)

Commodity	1964	1965	Principal sources, 1965
Metals:			
Iron and steel, semimanufactures	36,597	61,968	Japan 20,233; mainland China 19,432.
Nonferrous	598	952	Japan 462; mainland China 250.
Nonmetals:			
Asphalt, natural	7,666	4,293	Japan 3,341.
Cement	111,602	116,396	North Viet-Nam 51,900; mainland China 21,811.
Fertilizers, chemical	8,368	4,819	Tunisia 3,000.
Gypsum	1,189	4,563	Mainland China 4,298.
Mineral fuels:			
Coal	12,010	28,056	All from mainland China.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	366	309	Indonesia 199; Singapore 110.
Kerosine do.	198	215	Indonesia 128; Singapore 79.
Distillate fuel oil do.	708	743	Indonesia 417; Singapore 326.
Residual fuel oil do.	79	90	Singapore 53; Indonesia 37.
Lubricants do.	23	46	Singapore 36.
Others do.	23	12	Indonesia 9.

TRADE

Although data on mineral commodity trade for 1966 and 1967 were not available in time for inclusion in this report, it is almost certain that mineral commodity exports remained inconsequential while mineral commodity imports continued to account for a significant share of total trade as they did in 1964 and 1965 as shown in the following tabulation:

	Value (million dollars)		Mineral Commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1964	0.11	87.52	0.13
1965	.07	105.43	.07
Imports:			
1964	17.16	81.80	20.98
1965	23.49	102.93	22.82
Trade balance:			
1964	−17.05	+5.72	XX
1965	−23.42	+2.50	XX

XX Not applicable.

In 1965 Cambodia exported to South Viet-Nam 500 metric tons of mineral, industry material consisting of slag, scalings, dross, and ash valued at $14,000; and unspecified quantity of petroleum products (chiefly residual fuel oils) valued at $36,000 to Hong Kong and Singapore; and 7 metric tons of precious and semiprecious stones valued at $24,000, mainly to Switzerland. Mineral commodity imports in 1965, detailed in table 4, were in general much larger than in 1964, and their value was 37 percent above the 1964 total.

COMMODITY REVIEW

Metals. — *Aluminum.* — Through the United Nations (U.N.) Expanded Program of Technical Assistance, outcrops and weathered accumulations of bauxite have been explored in an area of low limestone hills in western Cambodia. The U.N. has also explored for bauxite in weathered zones of extensive basaltic lava flows in eastern Cambodia near the Mekong River,

Iron ore.—Iron ore reserves northeast of the Great Lake near the site of the planned Stung Gen hydroelectric power project reportedly contain 5 million tons of ore, but inadequate coal supply and the undeveloped nature of the region have discourage exploitation.

Lead, Zinc, and Gold.—Deposits of lead and zinc ore and outcrops of gold-bearing quartz veins have been reported in western Cambodia, where the French bilateral aid program has supported exploration.

Manganese.—A 120,000-ton deposit of manganese ore grading 15 to 39 percent Mn has been reported at an unspecified location.

Nonmetals.—*Cement.*—Cambodia placed an order for 20,000 tons of cement, valued at about $330,000, with Malayan Cement Ltd. and Pan-Malaysia Cement Works Ltd., the first direct large-scale cement order placed with Malaysian concern. The National Cement Company at Chakrey Ting, near Kampot, expects to raise

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annual output to 150,000 tons after 1967 through plant expansion.

Phosphates.—The Khmere Phosphate Company at Tuk Meas (Kampot) began production of phosphates in 1966 and expects to have an annual output of 12,000 tons after 1967.

Mineral Fuels.—*Petroleum.*—A 500,000-ton-per-year oil refinery was expected to be completed at Sihanoukville in 1968. A loan of 60 million francs and equipment were supplied by France. Plant operation is to be conducted by Société Khmère de Raffinage (65 percent) and the French Union Générale des Petroles (35 percent).

CEYLON [6]

Ceylon's mineral industry, although small, has registered a steady increase in recent years. In 1966 the value of production was about $7 million and preliminary estimates indicate a slightly higher level for 1967. Ilmenite, graphite, and precious and semiprecious stones remained Ceylon's principal contributions to the world mineral supply.

Significant developments in the minerals industry during 1967 included: Official opening of Ceylon Steel Corporation's rolling mill; start on construction of a cast iron foundry; doubling of the capacity at the Ceylon Cement Corp. plant at Kenkesan; progress on construction of the State-owned oil refinery at Colombo; and the sanctioning of investment in a fertilizer complex. In 1967 the Government adhered to its policy of political nonalignment and continued to trade with Communist and non-Communist Countries alike.

Early in 1966 work started on stage I of the Maskeliya Oya hydroelectric project. The project, the completion of which is scheduled for November 1968, will reportedly produce 75,000 kilowatts for the Northwestern province. Also under construction and due for completion by 1968–69 is a 5,940-kilowatt power station at Uda Walawe Dam.

Following the devaluation of the British pound, devaluation of the Ceylon rupee took place on November 22, 1967, from Cey Rs4.76 per US$1.00 to Cey Rs5.91 per US$1.00.

PRODUCTION

Although preliminary figures indicate that cement output more than doubled in 1967 and salt production advanced by 18 percent relative to that of 1966, overall mineral industry performance was not impressive. Exports of gem stones and of graphite, used in the absence of officially recorded output as a measure of production, indicated a decline in output of the former and essential stability in production of the latter.

Table 5.—Ceylon: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967 p
Metals:					
Ilmenite	19,088	46,158	49,189	54,209	53,138
Monazite	------	23	36	36	20
Zircon	------	50	36	151	120
Nonmetals:					
Cement	75,238	75,000	85,850	82,880	191,772
Feldspar	111	50	615	419	256
Gem stones (exports) carats	NA	NA	71,254	61,119	24,906
Glass sand	4,339	4,000	7,100	5,410	3,325
Graphite (exports)	8,419	10,847	8,880	10,025	10,367
Kaolin	1,016	1,500	816	1,616	2,615
Salt	23,000	52,000	78,200	64,486	75,808

p Preliminary. NA Not available.

TRADE

Ceylon's $69 million deficit in its balance of trade in 1966, in contrast to a $99.7 million surplus in 1965, reflected an unfavorable year for its economy. Total value of exports for 1966 was $357 million, a decrease of 13 percent from 1965, and the lowest since 1958, while the value of imports was $426 million, an increase of 9 percent. During the first half of 1967, compared with a like period for 1966,

[6] Prepared by Taber de Polo.

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imports declined but not as sharply as exports. The largest trade partners were the United Kingdom and mainland China, for both imports and exports, reflecting Ceylon's policy of entering into bilateral trade or payment agreements with a number of countries. The value of exports of mineral commodities amounted to about $7 million in 1966, with graphite, precious and semiprecious stones, and ilmenite ac-

Table 6.—Ceylon: Exports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Ilmenite	60,544	41,200	Japan 41,150.
Monazite (66 percent rare earth oxide)	12	75	All to United Kingdom.
Zircon (65 percent ZrO_2)	2	51	All to Japan.
Nonmetals:			
Gems, precious and semi-precious carats	71,254	61,119	West Germany 34,464; Japan 7,902; France 4,727.
Graphite	8,880	10,025	United States 4,416; United Kingdom 2,063; Japan 1,991.

Table 7.—Ceylon: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys, all forms	2,920	2,454	United Kingdom 1,311; Hong Kong 461; Belgium 390.
Copper and alloys, all forms	649	612	United Kingdom 398; India 63; Belgium 37.
Gold troy ounces	11,767	12,740	All from United Kingdom.
Iron and steel:			
Pig iron	830	1,411	United Kingdom 1,117; West Germany 281.
Semimanufactures	51,432	59,862	United Kingdom 18,846; Belgium 15,119; U.S.S.R. 10,813; Japan 10,106.
Lead and alloys, all forms	r 686	429	Burma 165; Australia 150; United Kingdom 112.
Tin and alloys, all forms long tons	2,226	3,077	United Kingdom 2,771.
Zinc and alloys, all forms	329	293	United Kingdom 104; Belgium 70; Australia 61.
Nonferrous base metals, n.e.s	56	23	Denmark 13; United Kingdom 5.
Nonmetals:			
Abrasives	145	179	United Kingdom 83; Czechoslovakia 42.
Asbestos, all forms	997	2,019	Canada 1,545; Italy 337.
Cement thousand tons	197	251	U.S.S.R. 115; Rumania 79; Japan 30.
Fertilizer materials:			
Nitrogenous	185,652	186,797	United Kingdom 138,972; Japan 30,799.
Phosphatic	r 52,571	47,940	United Arab Republic 40,254; Jordan 5,893.
Potassic	58,401	57,372	West Germany 38,967; France 15,393.
Other	21,140	34,895	Japan 13,361; United Arab Republic 4,758; West Germany 4,439.
Salt thousand tons	40	4	All from India.
Sulfur	1,939	2,089	West Germany 882; Belgium 675.
Talc	1,323	1,172	India 934; mainland China 206.
Mineral fuels:			
Coal thousand tons	139	31	India 18; Australia 13.
Coke	272	562	United Kingdom 473; Australia 88.
Petroleum refinery products:			
Gasoline thousand 42-gallon barrels	1,494	1,510	U.S.S.R. 716; United Arab Republic 634.
Kerosine do	r 1,426	2,278	U.S.S.R. 1,501; Rumania 465.
Distillate fuel oil do	r 2,440	2,490	U.S.S.R. 2,318; Iran 152.
Furnace and residual fuel oil do	1,973	2,374	Iran 1,329; U.S.S.R. 937.
Lubricants do	106	113	United States 98.
Asphalt do	r 36	130	Iraq 111; Iran 15.
Other	10	15	Rumania 8; Burma 5.

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counting for the bulk of the revenue. Import value of all mineral commodities, including nonferrous metal manufactures, constituted about 22 percent of the 1966 import budget (about $94 million). Major items were petroleum products, $27.94 million; metals (including steel, nonferrous metals, and nonferrous metal manufactures) $20.8 million; manufactured fertilizers, $17.8 million; cement, $4.2 million. Government budgeted import allocations of some mineral commodities for 1967 were $27.1 million for petroleum products, $23.2 for manufactured fertilizers, and $3.15 million for cement. However, preliminary information indicates that actual figures were lower.

A notable development in Ceylon's trade policy in 1967 was the placing of agencies controlling trade under the Minister of State. A series of joint stock companies were to be set up, including one for the import of fertilizers.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—The Government-owned Ceylon Steel Corporation officially opened its steel rolling mill at Oruwela on March 20, 1967, although production actually started late in 1966. The plant, built with U.S.S.R. aid, has a rated capacity of 60,000 tons of rolled products annually with two shifts, though the expected 1967 output was 30,000 tons. Plans call for developing a small integrated steel industry eventually using domestic iron ore and charcoal.

On December 30, 1967, construction started on a cast iron foundry in Enderamulla. The foundry, being built with West German assistance for the Ceylon State Hardware Corporation, is due for completion in November 1968 and will have annual capacity of 18,000 tons on a three-phase basis.

Study of domestic iron ore deposits continued. In June 1966, magnetometer work was started at Mahagama in Panirendawa district; this was an extension of 1962 studies in this area.

Ilmenite and Other Beach Sand Minerals.—Ilmenite production in 1967 almost matched the 1966 peak level of 54,000 tons. Anticipated production in 1968 is 70,000 tons, including 67,000 tons already contracted for by Japan interests. All output was from the plant of the State-owned Ceylon Mineral Sands Corp. at Pulmoddai on the northeast coast. Visible reserves, placed at 4 to 5 million tons, remain virtually constant because materials produced are replaced by new deposition during the monsoon period. Ceylon Mineral Sands Corp. was installing a plant at Trincomalee, about 50 kilometers south of Pulmoddai, to separate rutile and zircon from the tailings of ilmenite operations. It has been proposed to move the ilmenite plant to Trincomalee where more favorable weather conditions would permit year-round operations. Electrostatic separation equipment came from the United States.

The pilot beach sand plant in the Katukurunda area on the west coast, operated by the Geological Survey of Ceylon, was in operation during most of 1966, partly as a production unit and partly as a mineral dressing laboratory.

Nonmetals.—*Cement*—The Government-owned Ceylon Cement Corp. reportedly commissioned a second kiln and started operation of a clinker plant at its Kenkesan works near Jaffne at Ceylon's northern tip doubling its output in 1967. The company has reported budgeted for and started preliminary work on a second cement factory of 20,000-ton capacity at Puttlam.

Fertilizer Materials.—Ceylon, almost wholly dependent on imported manufactured fertilizers to sustain her predominately agricultural economy, in 1966 imported 300,000 tons of these materials which accounted for more than 4 percent of the value of total imports. The percentage was higher for 1967. In March 1966 the Government authorized a reported $25 million expenditure under the State Industrial Corporation for the manufacturing, processing, and marketing of all types of fertilizers. Initially, emphasis would be on production of nitrogenous fertilizers such as ammonium sulfate and urea.

Mineral Fuels. — *Petroleum.* — Ceylon continued to be dependent on imports for refined petroleum products. The U.S.S.R. supplied 638,000 tons of products valued at about $11.2 million in 1967, 60 percent of Ceylon's requirements with most of the rest coming from Rumania. Reportedly, late in 1967 the State-owned Ceylon Petroleum Corp. (CPC) agreed to buy from Rumania 140,000 tons of products con-

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sisting of kerosine, gas oil, and diesel oil for $2.54 million.

Although progress was made on CPC's oil refinery at Colombo, delays, preclude the opening until 1969. The reported annual throughput capacity of the refinery will be 1.7 million tons, sufficient to meet Ceylon's anticipated needs.

Caltex Ceylon, Ltd., Esso Standard Eastern (Ceylon), Inc., and Shell Company of Ceylon, Ltd., are reportedly receiving compensation for their facilities acquired by CPC when Ceylon nationalized petroleum products trade in 1964. Total payment agreed upon will be about $11.5 million payable over a 5-year period. Bunkering trade of some 400,000 tons per year plus aviation fuels and petrochemical products continue to be handled by Caltex, Esso, and Shell. Late in 1967 it was understood that CPC would issue a letter of intent to Shell for crude oil supply for the CPC refinery.

There have been no reports of results of oil exploration started in mid–1966 and continued through 1967 in the Jaffna Peninsula area and along the eastern coastal belt by French contractors appointed by CPC.

HONG KONG[7]

Iron ore, produced for export to Japan, remained Hong Kong's principal crude mineral product in 1967, accounting for more than 90 percent of the total crude mineral output value of about $1.4 million.[8] Kaolin, quartz, and feldspar were mined in small quantities for export and to meet domestic needs, while graphite and wolframite were produced in very small amounts, wholly for export.

Cement production, based on imported clinker and valued at $3.1 million in 1967, and coke and breeze produced from imported coal and valued at $167,000 swelled the total 1967 mineral industry to about $4.7 million ($5.0 million in 1966).

Although not considered part of the minerals industry, Hong Kong's sizable shipbreaking industry provides usable steel for both domestic and export markets. The value of scrap derived from shipbreaking as well as the value of steel semimanufactures produced from this scrap and from imported crude steel scrap are not included in the total value of mineral production. Nevertheless, if these items were included in mineral industry output value, extractive and processing sectors of the mineral industry contributed little to Hong Kong's gross national product, which approximated $2.37 billion in 1967 (current prices). However, imports of mineral commodities, including materials for both consumption by local industry and for reexport, were appreciable relative to domestic demand for products of these materials, and thus had a significant impact on the overall economy.

On September 30, 1967, there were in force 3 prospecting licenses, 17 mining licenses, and 3 mining leases. Mine and quarry workers totaled 1,399.

Industrial progress was unimpressive,

[7] Prepared by Arnold M. Lansche.

[8] Where necessary values have been converted from Hong Kong dollars (H.K.$) to U.S. dollars at the rate of H.K.$5.81=US$1.

Table 8.—Hong Kong: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Iron ore concentrate—thousand tons	114	116	134	137	144
Tungsten ore (wolframite) 60 percent WO_3 basis	8	1	7	r 8	5
Nonmetals:					
Cement—thousand tons	217	215	241	247	215
Feldspar	1,707	1,581	1,137	1,365	1,153
Graphite	808	721	-------	-------	19
Kaolin	5,099	5,124	4,787	5,863	8,570
Quartz	3,040	1,649	1,939	2,892	3,048
Mineral fuels:					
Coke and breeze—thousand tons	15	13	13	10	9

r Revised.

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with many steel rolling mills experiencing difficulties because of increased competition from cheaper imported steel products and the continuing recession in the construction industry. Building activity declined 22 percent and the number of building projects submitted for approval decreased 40 percent in the first 10 months of 1967.

On November 19 the Hong Kong dollar was devalued 14.3 percent. Protests from businessmen caused the Government to revalue the currency upwards by 10 percent on November 23, giving an official rate of US$1 to H.K. $6.06.[9]

PRODUCTION

The $300,000 decline in overall mineral commodity output value in 1967 relative to that of 1966 was chiefly the result of a 13 percent decline in cement output. Iron ore production increased for the fifth consecutive year, and kaolin output increased 46 percent, probably as a result of growth in domestic demand.

TRADE

Total value of Hong Kong's mineral commodity trade-imports, exports, and reexports was about $395 million in 1966, compared with $350 million in 1965. The following tabulation details this trade:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities (including fuels)	Total trade	
Exports and reexports:			
1965	85	1,143	7.4
1966	106	1,324	8.0
Imports:			
1965	265	1,569	16.9
1966	289	1,767	16.4
Trade balance:			
1965	−180	−426	XX
1966	−183	−443	XX

XX Not applicable.

Imports of metals in 1966, as in previous years, consisted primarily of aluminum, copper, and steel semimanufactures; metal exports and reexports were comprised mainly of scrap. Of the nonmetal imports, pearls and precious and semiprecious stones accounted for 71 percent of the total value. Construction materials accounted for most

[9] Far Eastern Economic Review. 1968 Yearbook. p. 169.

Table 9.—Hong Kong: Exports and reexports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Metals:			
Aluminum and aluminum alloys, all forms.	3,808	9,256	South Korea 2,242; South Viet-Nam 1,126; United Kingdom 1,124.
Copper, brass and bronze scrap	6,140	6,689	Japan 5,024.
Iron and steel:			
Iron ore—thousand tons	145	141	All to Japan.
Semimanufactured products—do	69	89	Thailand 41.
Scrap—do	129	115	Japan 51; Taiwan 45.
Nonmetals:			
Cement:			
Exports—thousand tons	10	26	Oceania 11; Philippines 11.
Reexports—do	12	69	Indonesia 53.
Feldspar and fluorspar	525	723	Philippines 450; Thailand 268.
Graphite:			
Exports	357	310	United States 152; Singapore 82.
Reexports	156	146	Thailand 84.
Gravel, crushed stone, and tarred macadam.	4,655	1,492	West Germany 1,422.
Kaolin	3,724	3,987	Japan 2,089; Taiwan 1,888.
Quartz	652	708	Thailand 668.
Mineral fuels (reexports):			
Petroleum refinery products:			
Gasoline—thousand 42-gallon barrels	r 22	40	Macau 23.
Kerosine—do	38	37	Mainly to Macau.
Distillate fuel oil—do	188	212	Do.
Residual fuel oil—do	10	8	Do.
Lubricants—do	112	115	Thailand 33; Taiwan 30.
Waxes—do	5	72	Thailand 25; Singapore 17; Formosa 14.
Other—do	6	17	Indonesia 12.

r Revised.

Source: Hong Kong Trade Statistics. Exports and Reexports. Commerce and Industry Department, Hong Kong. December 1965, 481 pp.; December 1966, 500 pp.

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Table 10.—Hong Kong: Imports of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and aluminum alloys, all forms.	10,465	11,265	Canada 4,669; United States 2,692; Australia 2,645.
Copper and copper alloys	9,740	8,512	United Kingdom 1,947; Australia 1,078.
Iron and steel:			
Iron ore	9,995	12,294	Mainland China 7,758.
Scrap, iron and steel. thousand tons	93	56	United Kingdom 23; West Germany 21.
Iron sponge and ferroalloys	10,041	14,097	North Korea 7,638; North Viet-Nam 5,017.
Semimanufactures thousand tons	528	413	Mainland China 179; Japan 125.
Ingots and equivalent forms	r 7,510	22,468	Australia 11,200; North Korea 10,585.
Lead and lead products	917	1,311	North Korea 898; Australia 154.
Platinum (unworked) troy ounces	22,049	26,033	West Germany 12,775; United Kingdom 9,207.
Silver (unworked) do	278,800	245,266	North Korea 161,373; United Kingdom 57,600.
Zinc and zinc alloys, all forms	3,960	5,726	Australia 2,326; North Korea 2,144.
Nonmetals:			
Cement thousand tons	1,116	910	Mainland China 690; Japan 145.
Diamond, gem carats	383,316	461,468	Belgium 194,693, Israel 121,965.
Fertilizers thousand tons	7	8	West Germany 5.
Gravel, crushed stone and tarred macadam.	4,661	2,855	Mainland China 2,314.
Gypsum	10,027	18,098	Australia 9,238; mainland China 7,946.
Lime thousand tons	66	50	Mainland China 29; North Viet-Nam 13.
Limestone do	329	324	Japan 288.
Quartz	3,417	3,113	All from mainland China.
Salt thousand tons	32	30	Mainland China 24.
Mineral fuels:			
Coal thousand tons	r 174	150	Mainland China 109.
Coke	r 5,609	5,305	Japan 3,902.
Petroleum refinery products:			
Gasoline. thousand 42-gallon barrels	r 646	802	Singapore 473; Bahrain 213.
Naphthas and solvents do	122	168	Iran 69; Indonesia 45.
Kerosine do	1,065	1,359	Japan 506; Singapore 380; Iran 245.
Jet fuel do	1,253	1,258	Singapore 446; Indonesia 251; Iran 236.
Distillate fuel oil do	2,471	3,078	Singapore 1,563; Japan 636; Iran 473.
Residual fuel oil do	9,247	9,414	Singapore 3,769; Saudi Arabia 3,531; Iran 1,436.
Lubricants do	217	241	United States 126; Singapore 36.
Waxes do	14	129	Indonesia 117.
Other [1] do	87	123	Singapore 65; Japan 30.

r Revised.
[1] Mostly asphalt.

Source: Hong Kong Trade Statistics. Imports. Commerce and Industry Department, Hong Kong. December 1965, 236 pp., December 1966, 236 pp.

of the remaining nonmetal import value. Refined petroleum products, mainly kerosine, jet fuel, and distillate and residual fuel oils, made up approximately 94 percent of the total value of mineral fuel imports in 1966. Petroleum reexports were primarily distillate fuel oil, lubricants, and waxes.

COMMODITY REVIEW

Metals.—*Iron and Steel.*—Production from Ma On Shan, Hong Kong's only iron ore mine, increased 5 percent in 1967 in response to increasing demand for iron ore in Japan.

There was a decline in demand for steel in the colony. Severe foreign competition from Japan and mainland China, resulted in The Shi Wing works ceasing production. Other mills also felt the competition. Shun Fung Ironworks Ltd. started up its new plant at Junk Bay in August. It has electric arc scrap melting furnaces and continuous casting and automatic rolling facilities with a total capacity of 300 tons per day of high and low tensile steel bars.

Nonmetals.—*Cement.*—The 1967 cement production decline was a result of labor

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disputes. The Green Island Cement Co. announced in June it hoped to restart the Hunghom cement plant and began hiring for the project. Dust produced in the manufacture of domestic cement was a problem and electrostatic precipitators have been employed.

An automated quarry was opened at Cha Kwo Ling (No. 1) in May with an initial capacity of about 180 tons an hour of aggregate ranging from 1½ inches to stone fines. Pioneer Quarries Ltd. expected to be able to provide aggregate for production of more uniform concrete.

Mineral Fuels.—*Coke and Breeze.*—The Hong Kong & China Gas Co., Ltd. produced coke and breeze as byproducts of coal gas manufacture from imported coal. Production ceased at the end of 1967 with the closure of the coal gas retort house.

LAOS[10]

In spite of insurgency, Laotian tin production increased in 1967, but plans for mining other mineral deposits were not carried out and delays occured in construction of the Nam Ngun hydroelectric facilities. As most of the tin produced in Laos is exported through Bangkok, Thailand, the Laotian Government endeavored to have railway rates for goods shipped through Thailand reduced. The general rate between Bangkok and Vientiane was reduced to 330 bahts per ton from 340 bahts at the end of 1967.

The United Nations Development Program approved $531,000 and the Government of Laos $90,000 toward the cost of a 21-month search for ferrous and nonferrous metals in the lower Mekong River Basin in Laos.

Laotian mineral production value in 1966, the latest year for which data are available, was equivalent to about 1 percent of the gross national product, which was estimated at roughly $189 million in current prices.

PRODUCTION

Statistical data are available only for tin and salt output in recent years, although simple construction materials—clays and sand and gravel—are undoubtedly produced, and very small quantities of other mineral commodities may also be mined. Available data for tin and salt are as follows:

Year	Tin concentrate (long tons)	Tin metal content (long tons)	Salt (metric tons)
1963	650	326	NA
1964	686	336	3,000
1965	569	284	3,000
1966	668	340	4,200
1967	e 1,250	e 625	NA

NA Not available.
e Estimate.

TRADE

The role of mineral commodities in overall Laotian trade in 1964 and 1965 (latest year for which data are available) is shown in the following tabulation:

	Value (million dollars)		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1964	0.7	0.9	77
1965	.6	1.0	60
Imports:			
1964	5.2	25.1	21
1965	6.6	32.9	20
Trade balance:			
1964	−4.5	−24.2	XX
1965	−6.0	−31.9	XX

XX Not applicable.

Tin was the only mineral commodity of export significance. In 1965 tin exports were valued at $614,000 compared with $691,000 in 1964 and were shipped chiefly to Singapore and Malaysia. Mineral fuels, largely petroleum refinery products, were overwhelmingly dominant among imports, with a value of $4.5 million. Aside from recorded mineral trade, Laos engages in a sizable trade in gold, which serves as the Government's principal money earner. A total of 1.7 million troy ounces of gold was reportedly imported in 1966 with a value of kip(K)30,110 million;[11] reexport statistics were not available.

[10] Prepared by Arnold M. Lansche.
[11] Although the official exchange rate is K290=US$1, import transaction are generally at the free rate, about K500=US$1.

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Table 11.—Laos: Imports of selected mineral commodities

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal sources, 1965
Metals:			
Aluminum	r 20	168	Taiwan 107.
Copper	47	NA	
Iron and steel: Semimanufactures	r 4,723	2,315	Thailand 1,018; Hong Kong 430.
Lead	5	NA	
Tin	r 96	NA	
Nonmetals:			
Calcium carbide	36	NA	
Cement	13,693	19,083	Thailand 18,755.
Fertilizers, mostly potassic	r 322	NA	
Salt	422	1,309	Thailand 1,307.
Sulfur	201	NA	
Mineral fuels:			
Petroleum refinery products:			
Aviation gasoline	thousand 42-gallon barrels 164	NA	
Motor gasoline	do r 324	300	Indonesia 155; Malaya 103.
Kerosine	do 37	42	Malaya 18; Indonesia 17.
Distillate fuel oil	do r 101	131	Malaya 68; Indonesia 47.
Residual fuel oil	do r 1	1	
Lubricants	do r 21	13	United States 8.
Other	do 8	NA	
Paraffin wax	do 1	3	Indonesia 1; United States 1.
Asphalt, bitumen, petroleum coke	do 8	12	Malaya 8.

r Revised. NA Not available.

COMMODITY REVIEW

Metals.—*Gold.*—Gold occurs in several localities in Laos, especially along the Mekong River and its tributaries. Ore samples assayed have ranged in gold content from 0.28 ounce to 3.33 ounces per ton.

Tin.—Recent modernization of the Phon Tiou tin mines in southern Laos, including installation of a new plant to treat dump material, accounted for expanded output, which by midyear totaled 629 long tons of concentrates and which was estimated at 1,250 tons for the year. Tin has been mined principally by French firms, but a 1967 agreement established a consortium of French and Laotian interests to improve mining and explore new areas.

Nonmetals.—*Cement.*—A study was in progress regarding construction of a cement plant with an output of 50,000 tons per year.

Salt.—It was reported that improvements were made in the salt refining facilities at Bankeun, several kilometers north of Vientiane.

MONGOLIA [12]

Mongolia's small mineral industry apparently made little progress during 1967, the second year of the 5-year plan for 1966–70. Coal production, which accounted for an estimated 60 percent of mine output value, increased by only a modest amount. This was clearly insufficient to meet energy demands of the country's growing coal-based industrial sector. Output of this fuel, a key item under the plan, appeared unlikely to be doubled by 1970 as intended. Construction materials, scheduled to increase 2 to 3 times during the plan period, remained in short supply. No information was available on fluorspar, Mongolia's only mineral product of world significance.

Comprehensive geological work continued, with assistance from most of the member nations of the Council for Mutual Economic Aid. Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, and the U.S.S.R. all allegedly participated in surveying and mapping activities. East German experts reportedly concentrated on exploration for rock crystal and gold and other precious metals. The overall program, which inspired the establishment of a Mongolian Ministry of Geology in 1966, was declared 94 percent complete in 1967.

[12] Prepared by Ronald A. Pense.

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PRODUCTION

Information on mineral production was available only for coal, where an increase of about 6 percent over that of 1966 was claimed. Amounts of finished building materials produced apparently increased, although falling short of projected goals.

Table 12.—Mongolia: Production of mineral commodities [1] [2]

(Thousand metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Nonmetals:					
Alabaster	15	20	20	20	25
Fluorspar	49	57	75	75	75
Lime	25	30	35	35	40
Salt	8	8	8	8	8
Mineral fuels:					
Coal [3]	845	710	990	r 1,004	1,060
Petroleum:					
Crude—thousand 42-gallon barrels	365	365	116	89	90
Refinery products:					
Gasoline—do	155	150	144	150	150
Distillate fuel oil—do	55	60	49	50	50
Residual fuel oil—do	205	205	192	200	200

r Revised.

[1] All figures are estimated, except coal (1963; 1965–66); crude oil (1965–66); and gasoline and distillate fuel oil (1965).

[2] In addition to commodities listed, Mongolia produces simple construction materials, and tungsten concentrates, the latter at a rate of 100 to 200 tons annually.

[3] Mainly so-called brown coal.

TRADE

Although no official Mongolian trade statistics are available, it is believed that officially recorded Soviet exports to Mongolia provided in table 13 are indicative of overall Mongolian mineral commodity imports. In the case of Mongolian mineral exports, Soviet statistics are less clear; the U.S.S.R. sources indicate total receipts of 56,200 tons of fluorspar in 1965 and 45,100 tons in 1966, but the origin of these imports is not reported. The same sources give value data by country of origin but the total value of all ores and concentrates received from Mongolia was less than one-third of the value of the recorded total fluorspar imports.

Mongolian-mainland China trade data are not available, but in view of the decaying political relations of these two countries little or no mineral trade is believed to have taken place.

Table 13.—Mongolia: Imports of mineral commodities from the U.S.S.R.

(Thousand metric tons unless otherwise specified)

Commodity	1965	1966
Metals:		
Iron and steel:		
Pig iron	1	1
Rolled steel	7	6
Iron and steel pipes	2	1
Nonferrous metals and alloys	(1)	(1)
Nonmetals:		
Cement	43	58
Mineral fuels:		
Bituminous coal	134	8
Coke	2	1
Petroleum:		
Crude—thousand 42-gallon barrels	314	331
Refinery products:		
Gasoline—do	818	819
Distillate fuel oil—do	367	332
Lubricants—do	87	86
Other—do	4	3

[1] Less than ½ unit.

Source: Data derived from official export statistics of the U.S.S.R.

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COMMODITY REVIEW

Metals.—*Iron and Steel.*—Basic construction on the U.S.S.R.-designed 300,000-metric-ton integrated Darkhan iron and steel plant presumably continued in 1967 but lack of reporting on this project indicated that difficulties may have been encountered.

Tungsten.—Reported references to labor inefficiency at the Ih Hairhan and Burentsogt mines implied that output, which fell short of production plans in 1966, also lagged in 1967. These wolframscheelite mines accounted for all of Mongolia's tungsten concentrate production.

Nonmetals.—*Construction Materials.*—Output of construction materials such as sand, gravel, limestone, and clay and production from brick and concrete plants fell short of expectations in 1967. Requirements for Ulan Bator, one of the two major commercial centers of Mongolia, were estimated at 300,000 metric tons of crushed rock, 250,000 tons of gravel, 125,000 tons of sand, and 10,000 tons of lime. While sand and lime sources were considered adequate, only about 40 percent of the gravel and 5 percent of the crushed rock was allegedly available at the beginning of the year. Construction product plants at Ulan Bator included a regular concrete mixing plant, a lightweight concrete mixing facility with an annual capacity of 50,000 tons, and three brick factories, of which the regular concrete plant apparently failed to fulfill quotas. At Darkhan work continued on Mongolia's first cement plant, which is being built with Czechoslovakian aid. The plant's initial 100,000-ton-per-year-capacity is later to be doubled. A plant to produce 30 million bricks and 22,000 tons of lime annually was also under construction at Darkhan with Polish assistance. Other important construction material plants operating in 1967 included the Dundgob Aymak alabaster and Tsagaan Bula lime factories, each with an annual capacity of 10,000 tons.

Mineral Fuels.—*Coal.*—Development of the Sharyn Gol opencut coal mine, an important factor in the establishment of the Darkhan industrial center, apparently proceeded slowly. Only about 30,000 tons of coal was extracted during the first 8 months of 1967. When completed, this mine is expected to have an annual capacity of 1.1 million tons, exceeding that of the Nalaikha mine near Ulan Bator, A mechanization program was under way at Nalaikha where poor labor discipline and organization have been blamed for failure to meet production goals. Although about 10 other coal mines were in operation or being developed to severe remote areas of the country, the Sharyn Gol and Nalaikha mines will undoubtedly remain the only pits of importance.

Petroleum.—The Mongolian petroleum industry in 1967 consisted of the Sayn Shanda field in the Gobi Desert and the adjoining Soviet-built Dzuun Bayan refinery, which together employed an estimated 550 to 600 persons. The U.S.S.R. probably continued to supply most of the crude oil requirements of the refinery and the greater part of the refined products consumed by the Mongolian economy.

NORTH VIET-NAM[13]

North Viet-Nam has significant resources of chromite, apatite, and anthracite coal, but output of each was believed sharply cut back in 1967 by war damages. In recent years the total value of production of minerals has been estimated at roughly $100 million, perhaps 15 percent of gross national product.

For its size of approximately 63,000 square miles, North Viet-Nam is well endowed with a variety of minerals, in contrast with South Viet-Nam. Thus, North Viet-Nam is one of the fairly rich countries in Southeast Asia in mineral resources.

The Government's economic planning has included search for and development of mineral resources. In this respect, Hongay, Campha, Vong Bi, Mao Khe, Trang Bach, Lang Cam, and other mineral centers have received particular attention. Plans have been made to construct mining and smelting facilities to produce aluminum, iron, and zinc. Industrial projects planned or in various stages of completion include modernization and expansion of existing installations, such as the cement plant in Haiphong, the iron and steel mill in Thai Nguyen, various fertilizer installations

[13] Prepared by Arnold M. Lansche.

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throughout the country, and power-generating stations. Among major projects was the expansion of the Haiphong port to enable it to handle larger ships and twice the amount of present traffic. Financial and technical aid for these and other projects is expected to come from mainland China, the U.S.S.R., and other Communist countries.

PRODUCTION

Mining of various ores, coal, and production of cement continued during the year on a reduced scale.

North Viet-Nam has produced undisclosed quantities of gold, lead, tin, zinc, asbestos, clays, dolomite, glass sand, kaolin, mica, and pyrite, and is believed to have facilities to process or refine antimony, copper, lead, manganese, and mercury. Condition of the latter facilities, however is undetermined at this time.

Table 14.—North Viet-Nam: Production of selected mineral commodities

(Metric tons)

Commodity	1963	1964 e	1965 e	1966 e	1967 [1]
Metals:					
Chromite	30,300	30,000	30,000	30,000	NA
Iron ore	--------	NA	300,000	NA	NA
Iron and steel	--------	80,000	150,000	NA	NA
Nonmetals:					
Apatite thousand tons	925	1,000	1,000	1,000	NA
Cement do	491	649	750	750	NA
Phosphate rock do	e 50	50	50	50	NA
Salt do	128	150	150	150	NA
Mineral fuels:					
Coal (mainly anthracite) do	3,347	3,400	3,500	3,500	NA

e Estimate. NA Not available.
[1] No attempt has been made to estimate production in 1967 because of war damage.

TRADE

Official trade statistics for North Viet-Nam are not available. The U.S.S.R., Japan, mainland China, and West and East European countries have been factors in North Viet-Nam trade. The principal import was petroleum refinery products mainly from the U.S.S.R., with smaller quantities of aluminum, copper, iron, and steel also imported.

North Viet-Nam's chief mineral export has been anthracite coal, most of which has gone to Japan. Japan received 253,487 metric tons of anthracite from North Viet-Nam in 1967 compared with 361,392 tons in 1966. It is understood that mainland China received sizable quantities of anthracite, apatite, and chromite from North Viet-Nam in 1966. Apatite also has been shipped in large quantities to East European countries.

COMMODITY REVIEW

Metals.—*Chromite.*—North Viet-Nam's chromite mines are centered about Co Dinh, about 40 kilometers from Thanh Hoa. One of the major mines in the vicinity of Le River has employed as many as 2,000 workers and has one mechanized and two manual sections. In the manual sections employees are divided into groups of four or five. Climatic conditions, monsoons, and drought, hamper the work to some extent.

Iron and Steel.—The Thai Nguyen iron and steel complex, North Viet-Nam's first steel mill, was bombed and presumably put out of action during the greater part of 1967. The plant had an annual capacity estimated at 200,000 tons utilizing three blast furnaces.

The Thai Nguyen complex reportedly could produce 150,000 tons of coke and 130,000 tons of iron sinter annually. Iron ore was provided by the Trai Cau mine, which reportedly had reserves of more than 2 million tons of ore containing about 60 percent iron. The Trai Cau mine, North Vet-Nam's first iron mine, went into trial operation in 1964 and reportedly had the capacity to provide approximately 300,000 tons of ore per year.

Tin.—Although there are a number of tin occurrences in North Viet-Nam, especially in the Tinh Tuc district of Cao Bang

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Province, production of the metal has always been small. Since the partition of Viet-Nam, the North Viet-Namese Government has reopened, expanded, and mechanized the Tinh Tuc mine with capital and technical assistance from the U.S.S.R. and East European countries.

Nonmetals. — *Cement.* — The Haiphong Cement Works, the principal cement plant in North Viet-Nam, was bombed in 1967. Plant capacity was on the order of 500,000 tons per year. Planned expansion was to have increased capacity by 30 to 35 percent. There were several small cement plants at Nghe An and Sai Son with combined capacity of 150,000 to 200,000 tons per year.

Fertilizer Materials.—North Viet-Nam had about six phosphate plants with a total capacity of about 200,000 tons of phosphate fertilizers. The 100,000-ton-per-year, Soviet-equipped superphosphate plant at Lam Thao reportedly was one of the most modern of its kind in Asia. The superphosphate product has 20 to 21 percent available phosphorous pentoxide (P_2O_5). The plant is equipped to produce 40,000 tons of sulfuric acid per year. Raw material for Lam Thao comes from the Laokay apatite mine, which contains more than 300 million tons of ore grading from 11 to 37 percent P_2O_5. The Lam Thao plant could supply about 14 percent of North Viet-Nam's total annual requirement—about 700,000 tons—of phosphate fertilizer based on 5.4 million acres of cultivated area and assuming application at rate of 185 pounds per acre.

Mineral Fuels.—*Coal.*—North Viet-Nam has deposits of an excellent grade of anthracite located principally along the northeastern coast, near Hon Gai. About 8,000 workers have been reported in recent years at the Hon Gai mine and about 700 at the Deo Nai mine, 40 kilometers away from the former mine. Coal reserves at Deo Nai reportedly total 5 billion metric tons. The seven principal mines are believed to range in size from 100,000 to 1 million tons annually. About one-fourth of the output is exported to mainland China and Japan.

SOUTH VIET-NAM[14]

The war sharply reduced overall industrial development in South Viet-Nam during 1967, and the mineral industry suffered along with other industries. Work on the An Hoa industrial complex, about 65 kilometers from Danang, was stopped except for the completion of the civil engineering work involved. The complex was to include a fertilizer plant, with annual production of 42,000 tons of urea and 48,000 tons of ammonium sulfate, and several plants to produce ammonia and sulfuric acid. In contrast, however, in the relatively secure area of Saigon, some industries such as glass, asbestos, and chemicals increased production. Funds of the U.S. Commercial Import Program were allotted in June 1967 to the extent of $3.2 million to double existing electrical-generating capacity in the Saigon area because of the large increase in demand.

The country's Gross national product in 1966 was estimated at $2,086 million compared with $1,775 million (at a conversion rate of US$1=VN$350 in 1965). Beginning in October 1, 1967, U.S. Government agencies and contractors purchased piastres at the rate of VN$118 to US$1 compared with the previous rate of VN$80 to US$1.

PRODUCTION

Mineral production data for South Viet-Nam were not available for 1967. Mineral areas were generally insecure and mining was disrupted by war.

[14] Prepared by Arnold M. Lansche.

Table 15.—South Viet-Nam: Production of metals and minerals

Commodity		1963	1964	1965	1966	1967
Nonmetals:						
Cement	thousand metric tons	---	75	198	135	NA
Clays	thousand cubic meters	35	120	100	100	NA
Salt	thousand metric tons	196	189	161	160	NA
Silica sand	thousand cubic meters	255	e 220	e 220	e 200	NA
Mineral fuels:						
Coal, anthracite	thousand metric tons	104	77	-----	-----	-----
Fuel briquets	do	55	55	50	30	NA

e Estimate. NA Not available.

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TRADE

South Viet-Nam imported most of its mineral commodities in 1965 from the United States ($25.5 million, chiefly iron and steel products); Taiwan ($21.3 million, chiefly cement and iron and steel products); and South Korea ($16.4 million, chiefly iron and steel products). All petroleum products utilized in the Country were imported. The value of overall mineral commodity trade and total trade for 1964 and 1965 the latest years for which data are available was as follows:

	Value (million dollars) [1]		Mineral commodities' share of total (percent)
	Mineral commodities	Total trade	
Exports:			
1964	.88	48.46	2
1965	.32	35.49	1
Imports:			
1964	73.62	297.60	25
1965	103.06	356.56	29
Trade balance:			
1964	−72.74	−249.14	XX
1965	−102.74	−321.07	XX

XX Not applicable.
[1] Excludes many military goods.

Table 16.—South Viet-Nam: Imports of selected metals and minerals

(Metric tons unless otherwise specified)

Commodity	1964	1965	Principal sources, 1965
Metals:			
Aluminum and alloys, all forms	5,631	5,714	Taiwan 2,340; United States 1,453.
Copper and alloys, all forms	1,386	NA	
Iron and steel:			
Pig iron	4,099	6,968	Taiwan 5,072; United States 1,896.
Bars, rods, angles, shapes, sections	64,329	93,860	Taiwan 32,591; India 20,297.
Universals, plates, and sheets	55,416	99,893	United States 51,716; South Korea 35,613.
Hoop and strip	456	411	United States 125; Taiwan 119.
Rails and track materials	2,651	4,662	United States 4,643.
Wire (exclusive of wire rod)	9,094	10,459	Taiwan 7,839.
Tubes, pipes and fittings	10,095	7,137	France 3,828; United States 2,470.
Lead and alloys, all forms	488	453	United States 395.
Metallic oxides for paint	1,336	2,092	United States 873; India 727.
Tin and alloys, all forms—long tons	213	3,226	United States 3,015.
Zinc and alloys, all forms	416	1,036	Belgium-Luxembourg 596.
Nonmetals:			
Abrasives, natural	967	NA	
Asbestos, crude	1,172	3,064	All from United States.
Cement and lime—thousand tons	437	426	Taiwan 306.
Clays:			
Construction and refractory	50,334	2,147	Japan 2,083.
Other	100	238	United States 237.
Feldspar, mica, quartz, related nonmetals.	169	NA	
Fertilizers:			
Natural phosphates	46,662	4,300	Tunisia 3,800.
Manufactured:			
Nitrogenous—thousand tons	77	38	Taiwan 23.
Phosphatic	34,485	119,192	Tunisia 78,827; United States 25,568.
Potassic	7,329	8,128	Israel 7,020.
Sulfur	161	1,642	Taiwan 1,500.
Mineral fuels:			
Coal	22,485	NA	
Coke	979	997	Taiwan 700.
Petroleum refinery products:			
Gasoline—thousand 42-gallon barrels	1,123	1,367	Malaysia 960.
Kerosine—do	598	754	Malaysia 405.
Fuel oil:			
Distillate—do	1,260	1,826	Malaysia 1,061.
Residual—do	1,407	1,593	Malaysia 1,221.
Lubricating oils and grease—do	152	131	United States 70, Netherlands Antilles 52.
Mineral jelly and wax—do	49	39	Indonesia 37.
Asphalt—do	126	NA	

NA Not available.

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Sand and salt are the principal mineral exports of the country, although, in 1966 South Viet-Nam exported no sand to Japan, usually the only recipient. Sand exports in 1965 totaled 79,910 metric tons valued at $289,000. Exports of salt in 1965, all to Japan, totaled 5,000 metric tons valued at $22,000, a decrease of 87 percent in quantity compared with 1964 exports; data for 1966 were not available.

COMMODITY REVIEW

Nonmetals.—*Limestone and Cement.*—Limestone reserves were estimated at 56 million tons at Kien Luong in Kien Giang Province; 5 million tons at Long Tho 3 kilometers west of Hue; and 40 million tons at Hiep Than.

The Ha Tien Cement Company, South Viet-Nam's only cement producer in the past has obtained limestone for its operations from the Kien Luong deposit. The company used clinker imported from Taiwan in 1967 for its grinding operations near Saigon because of local transportation problems.

Proposals have been made to build a cement plant to utilize limestone from Long Tho or Hiep Than, but by yearend no action had been taken.

Mineral Fuels.—*Coal.*—The only significant coal mine in South Viet-Nam at Nong Son has not yet been restored to operations since it was flooded by typhoon in 1963 and received sabotage damage in November 1964.

Petroleum.—South Viet-Nam continued to rely on imports for petroleum supplies; these were distributed by three U.S. companies.

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The Mineral Industry of Other South Pacific Islands

By John A. Stock [1]

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Makatea	1031	Papua and New Guinea	1034

BRITISH SOLOMON ISLANDS

There was no commercial mineral industry in the British Solomon Island Protectorate (BSIP) although a small annual output of gold continued. The Protectorate, an elongated group of seven principal and numerous minor islands, begins adjacent to Bougainville Island, Territory of New Guinea, and extends southwestward nearly 1,600 kilometers. The larger islands are Choiseul, New Georgia, Santa Isabel, Malaita, Guadalcanal, San Cristobal, and Santa Cruz.

Almost all the alluvial gold was recovered on Guadalcanal by panning methods. Production for recent years was 310 troy ounces in 1965, 394 in 1966, 672 in 1967.

In recent years there has been a growing interest in the geology, mineralization, and geophysical anomalies of the Solomons by foreign mining companies and international scientific groups. The most important known mineralization consists of low-grade nickeliferous laterite deposits on Santa Isabel and San Jorge Islands. Copper and manganese occur on other islands. A bauxite deposit discovered on the island of Kolombangara in 1965 has been undergoing exploration by the BSIP Geological Survey Department. In the last quarter of 1965 a gravity-magnetic-bathymetric survey covering 10 million square kilometers of the surrounding seas was started and completed with the aid of U.S. scientific groups. An intensive aerogeophysical survey started in November 1965 by the Swedish A.B.E.M. Geophysical Co., and financed ($1.5 million) by the United Nations Special Fund and the British Government was completed in October 1966. The Florida Group, Santa Isabel, San Jorge, and Guadalcanal have been covered in varying degrees by an airborne survey team that obtained magnetrometric, electromagnetic, and scintillometer data.

A followup ground survey was being conducted by the BSIP Geological Survey in 1967. The ground survey group includes personnel from the United Nations and the BSIP Geological Survey with a large native staff. Guided by the aerial survey anomalies, this survey was utilizing a variety of geological and geophysical techniques in the search for nickel, tin, copper, gold, phosphates, and iron. Already the aerial anomalies indicate a possible vein of nickel sulfide on San Jorge Island, the existence of highgrade bauxite on Rennell Island, an extension of low-grade copper deposits on Guadalcanal, and an enriched extension of a known manganese deposit. Test drilling of the San Jorge vein is planned for 1968. Another geophysical investigation, financed by the U.S. Navy, was to interpret unusual anomalies detected from satellites, supporting the geophysical surveys of 1963–64 and of 1965. This in-

[1] Mining engineer, Division of International Activities.

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vestigation presumably began in late 1966 with personnel from the Hawaii Institute of Geophysics using three ships, and was to consist of refraction tests of the seabeds.

Conzinc Riotinto (Australia) Exploration Pty. Ltd. (CRA) in late 1966 resumed reconnaissance geochemical drainage sampling of rivers of Choiseul and parts of Santa Isabel and Guadalcanal.

International Nickel Southern Exploration Ltd. (Inco-Sx) has been prospecting nickeliferous laterite deposits on Santa Isabel and San Jorge Islands. Metallurgical tests were run on 500 tons of ore in 1966. In 1967 the company was granted an interim permit to mine and planned to stockpile 50,000 tons of ore and conduct benefication tests in 1968 before deciding on a full-scale mining venture. This proposed work will bring Inco's total investment in the laterite deposits to $1.4 million. The possible nickel sulfide vein located by the aerial anomalies is on Inco's concession on San Jorge Island and may influence the decision.

CHRISTMAS ISLAND

Christmas Island, an Australian Territory in the Indian Ocean, has, as its only industrial activity, the mining and exporting of phosphate rock and phosphate dust. The deposits are operated by the Christmas Island Phosphate Commission, which is owned equally by the Australian and New Zealand Governments and managed by the British Phosphate Commissioners. The principal mining activity is at South Point.

Exports of phosphate rock in bulk and phosphate dust in bags by country of destination in recent years were as follows, in metric tons:

Fiscal year ending June 30 of that stated	Australia	Singapore and Malaya	Borneo	New Zealand	Total
1962	630,660	71,765	1,628	----------	704,053
1963	559,599	74,074	3,781	----------	637,454
1964	764,081	67,938	----------	----------	832,019
1965	779,902	76,916	----------	----------	856,818
1966	781,535	77,169	----------	20,303	879,007

More than half the island's total imports consist of fuel oil and gas oil; receipts of these commodities amounted to 17,004 tons in 1965 and 19,036 in 1966.

The $6 million program designed to increase annual production of phosphate from 708,000 to 1.6 million metric tons continued through 1967 and is scheduled for completion in 1968. A study by the Australian Bureau of Mineral Resources, Geology, and Geophysics and the Christmas Island Phosphate Commission aims to eventually increase annual production of phosphate rock to 2.3 million metric tons. Former estimates placed the reserves of phosphate at 200 million tons, but a recent survey indicated the presence of larger quantities. However, some of this is low grade or unsuitable for making superphosphate, and work was underway to develop a method for utilizing these reserves.

FIJI ISLANDS

The value of Fiji mineral production in 1966 and 1967 was estimated at $6.5 million and $6.7 million[2], annual increases of about 1 and 4 percent, respectively. Of these totals, gold represented about 60 percent and cement about 20 percent. Output of gold in 1966 and 1967 exceeded that of 1965 and cement production continued to increase with a gain of 16 percent in 1967. Manganese ore production during these 2 years remained substantially the same as in 1965.

A total of 2,470 persons were employed in mining and quarrying industries during

[2] Concurrently with, and in the same proportion as the United Kingdom, the Fijian pound was devaluated on November 19, 1967, bringing the exchange rate to about US$2.15. However, all values given herein have been converted at the prior rate of F£1 equals US$2.50.

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1966 compared with 2,373 in 1965 and 2,222 in 1964.

By early 1967, the Geological Survey Department had mapped nearly three-fourths of this British colony and has continued to assist the Emperor Gold Mining Co. Ltd. in a geochemical survey of the Tavua goldfield including the collection and analysis of 17,156 grid samples. As a result of unsuccessful prospecting in western Viti Levu, at yearend 1966 Kennecott Explorations (Australia) Pty. allowed its prospecting license to lapse. A partial survey of islands in the Lau Group indicated deposits of phosphate sufficient to provide Fiji's requirements for 200 years.

The Banno Mining Co. Ltd. continued development of the opencut mine and mill construction during 1966–67. The complex, designed to mine 2,500 tons of ore and ship 500 tons of concentrate monthly, commenced operation early in 1968. The company also continued drilling and exploration at its Wainikoro prospect.

The new Mining Ordinance, 1965, and new Mining Regulations, 1966, were put into effect on December 16, 1966. Major changes include the dissolution of, and transfer of the Mining Board's functions to the Director of Mines as well as amendments to mine safety regulations. A change in the administration of the Explosives Ordinance now requires all Government employees to be bound by the Ordinance for storage, use, handling and licenses for explosives.

PRODUCTION

Details of mineral production for the years 1963–67 are given in table 1.

Table 1.—Fiji: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Copper ore, gross weight	30	50	22	4	3
Copper metal	----	----	----	(1)	2
Gold, troy ounces	107,262	100,493	109,095	112,567	111,028
Iron ore (55–60 percent iron), thousand tons	1	----	3	----	----
Manganese ore (40–50 percent Mn)	3,285	911	5,479	r 5,326	5,939
Silver, troy ounces	46,870	60,564	60,470	67,499	61,335
Nonmetals:					
Cement	NA	30,971	39,616	40,855	47,373
Lime	5,438	3,471	3,222	2,445	2,821
Limestone	----	----	r 18,347	r NA	11,661
Stone, sand and gravel:					
Coral sand, cubic meters	19,904	27,524	32,871	r 39,583	2 59,863
Sand and gravel, do	264,071	222,281	510,135	e 377,000	295,613
Stone, quarried, do	301,244	182,793	295,522	r 314,867	275,882

e Estimate. r Revised. NA Not available.
1 Less than 1 unit.
2 Quantity in metric tons.

TRADE

Fijian trade declined in 1966 compared with that of 1965, with value of total imports and mineral imports declining more than values of comparable exports. In 1966 total exports were valued at $40.3 million and total imports at $63.2 million. Exports of mineral commodities were valued at $4.06 million, 93 percent of which was gold and silver. Over 94 percent of the $10.47 million of mineral imports consisted of refined petroleum products ($6.7 million), steel semimanufactures ($1.8 million), and fertilizers ($1.4 million).

Table 2.—Fiji: Exports of principal mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal destinations, 1966
Copper ore	22	1	All to Australia.
Gold, in bullion, troy ounces	112,060	109,732	Do.
Manganese ore and concentrate	4,809	5,171	All to Japan.
Metal scrap	33	----	
Silver [1], troy ounces	61,536	67,783	All to Australia.

1 Contained in gold bullion.

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Table 3.—Fiji: Imports of principal mineral commodities

(Metric tons unless otherwise specified)

Commodity	1965	1966	Principal sources, 1966
Metals:			
Aluminum and alloys, semimanufactures	48	50	United Kingdom 30; Australia 12.
Copper and alloys, semimanufactures	68	60	United Kingdom 44; Australia 10.
Lead and alloys, semimanufactures	79	53	United Kingdom 40; Australia 11.
Tin and alloys, semimanufactures	308	278	United Kingdom 243; Australia 34.
Other nonferrous metals and alloys, semimanufactures.	83	99	Australia 80; United Kingdom 9.
Steel:			
Primary forms	80	413	Japan 261; Australia 112.
Structurals, rails, pipe, etc	16,488	10,315	Australia 4,731; Japan 2,597.
Nonmetals:			
Cement	1,140	681	United Kingdom 662.
Salt	1,525	2,231	Australia 1,299; United Kingdom 843.
Fertilizer materials, all types	33,968	23,468	Japan 22,130.
Mineral fuels:			
Coal	3,029	2,035	All from Australia.
Coke	314	269	Australia 258.
Petroleum, refinery products:			
Gas- thousand 42-gallon barrels	292	252	Mainly from Iran and Singapore.
oline and benzine.			
Kerosine and jet fuel do	531	488	Mainly from Australia and Malaysia.
Diesel fuels do	502	512	Mainly from Australia and Singapore.
Residual fuel oils do	121	150	All from Australia.
Lubricating oil and greases do	16	18	Mainly from Australia and United Kingdom.
Bitumen do	18	10	Mainly from Japan.

COMMODITY REVIEW

Metals.—*Aluminum.*—Interest has been shown in bauxite deposits at Wainunu on Vanua Levu by Bauxite Fiji, Ltd., a company owned by the Nippon Light Metal Co., Showa Denko, K.K., and the Sumitomo Chemical Co., all of Japan. Depending upon results of feasibility studies, and its ability to obtain a mining license and suitable tax concessions, Bauxite Fiji has made tentative plans to invest $3 million in the project. Reserves are estimated at 6 million tons of ore, and other deposits may be present in the area. Plant construction will require 2 years.

Copper.—During 1966, activities of Banno Mining Co. Ltd. at its two copper leases on Vanua Levu island included mine preparation and construction at the Undu mine, on Undu Point and the start of exploration at the Wainikoro site. Banno is a wholly owned subsidiary of Fiji Mining Co., which is in turn owned by Dowa Mining Co. Ltd., and the Daiwa Bank Ltd., both of Japan. Dowa and Daiwa have provided technical assistance and financing for mining and beneficiation at the Undu mine. Total reserves of both sites have been estimated at about 3 million tons with 2 to 3 percent copper and some zinc content. Completion of the $170,000 concentrator at Undu Point is planned for January 1969. Expected daily output of the plant is estimated at 200 tons of concentrate containing 22-25 percent copper, as well as zinc concentrate.

Gold.—The Emperor Gold Mining Co. Ltd. on Viti Levu milled 295,799 metric tons of ore and recovered 115,658 ounces of gold, with 64,812 ounces of silver, during the year ending June 30, 1966. During the year ending June 30, 1967, 318,758 tons were milled yielding 114,299 ounces of gold with an estimated 63,140 ounces of silver. Measured reserves on June 30, 1967, were 938,170 tons averaging 0.421 ounce gold per metric ton.

Because of rising costs Emperor applied to the Fiji Government for financial assistance in order to improve its reserve position. To keep the mine open, the Government agreed to subsidize the company at the rate of F£340,000 per year for 3 years beginning in April 1967. The subsidy funds will be used primarily for exploration and development at Vatukoula and in surrounding areas within the Tavua Basin. Aid to the company by the Department of Geological Survey continued in 1967 in the form of prospecting, drilling, geochemical sampling, and analysis.

Manganese Ore.—The primary sources of manganese ore during 1966 were the Nabu and Koroviko mines which reported outputs of 4,958 and 368 metric tons, respectively. A small amount also came from the Nasinu mine. Manganese prospecting

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during 1967 was virtually limited to western Viti Levu. Mining continued into early 1968 at the Nabu and Koroviko mines and plans have been made to start operations at Vunimoli No. 1 and No. 2 mines.

MAKATEA

Production and export phosphate sands from Makatea amounted to 200,113 metric tons during 1966 and represented the final shipment from the island. In 1967 it was reported that the deposits were exhausted and are no longer being worked. Recorded exports have been as follows:

Year	Japan	New Zealand	Other countries	Total
1962	219,637	87,900	14,054	321,591
1963	194,531	120,198	6,518	321,247
1964	171,424	195,585	7,108	374,117
1965	160,439	158,153	28	318,620
1966	NA	NA	NA	200,113

NAURU AND OCEAN ISLAND

Phosphate remained the only mineral product of the Republic of Nauru and of Ocean Island in the British Gilbert and Ellice Islands Colony. Operation and management of this mining industry has been by the British Phosphate Commissioners (representing the Governments of the United Kingdom, Australia, and New Zealand). These islands supply the bulk of Australian and New Zealand phosphate rock requirements. Production, all for export, has been as follows:

Year	Metric tons		
	Nauru	Ocean Island	Total
1962	1,539,976	260,769	1,800,745
1963	1,572,075	361,844	1,933,919
1964	1,849,278	328,030	2,177,308
1965	1,479,912	365,089	1,845,001
1966	2,036,766	380,033	2,416,799

Phosphate reserves on Nauru are expected to last for 25 to 30 years; Ocean Island reserves are expected to last only until about 1981.

On January 31, 1968, the Trust Territory of Nauru became the Republic of Nauru with a provisional constitution. Under agreement with Australia, United Kingdom, and New Zealand, Nauru will buy the assets of the British Phosphate Commissioners in a handover period of 3 years. Assets are estimated at about $22.4 million. When the phosphate is depleted, the Nauruans will have accumulated invested trust funds of at least $400 million which should yield an annual income of about $24 million for the population which at present numbers about 3,100.

NEW CALEDONIA

Exports of New Caledonia's mineral production were valued at over $77 million in 1967, compared with $70 million in 1966 and $61 million in 1965. These included iron ores, nickel ores, and smelter products in 1965 and 1966. In 1967 a small quantity of chrome ore was exported, but this was presumably from open pit mines in the Tontouta region and the prospects for expansion of this output seem unfavorable. Small tonnages of giobertite, a magnesium carbonate, continue to be produced for local refractory use.

New Caledonia was the third largest world producer of nickel in 1967. With expansion and the aid of foreign capital, it is planned to increase New Caledonia's output to at least 100,000 tons per year by 1971, when world annual requirements are expected to reach 600,000 tons.

In the latter part of 1967, with the approval of the French Government, Kaiser Chemical & Aluminum Corp. of the United States in partnership with the Société le Nickel formed two companies—Kaiser Le Nickel Corp., and The New

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Caledonia Nickel Co. The former, will market ferronickel products in North America, and the latter will supply Kaiser Le Nickel, with nickel ore and ferronickel.

International Nickel Co. of Canada (Inco) joined with a consortium of French companies in 1967 to form a firm to develop nickel resources in New Caledonia. The joint venture expects to produce 23,000 to 45,000 tons of nickel annually.

PRODUCTION

Nickel ore production was at a record high in 1967. Despite declining iron ore output, increased output of nickel ore and metallurgical products resulted in a steadily rising value of total mineral production.

TRADE

Mineral product exports valued at $77.8 million in 1967 accounted for about 97 percent of New Caledonia's total exports. The exports of nickel ores and products in 1967 continued their directions established in recent years. The bulk of ferronickel exports has been to France while large quantities of nickel matte were exported to Canada and Japan. All nickel ore exported in 1967 went to Japan, and was a record high of over 1.5 million tons.

Table 4.—New Caledonia: Production of mineral commodities

(Metric tons unless otherwise specified)

Commodity	1963	1964	1965	1966	1967
Metals:					
Chromite (51–53 percent chromium oxide)	------	-------	-------	-------	1,824
Iron ore (55–56 percent iron)---thousand tons	299	307	279	220	204
Nickel:					
Ore [1]---do	1,934	2,615	2,648	r 2,892	p 3,800
Metallurgical products: [2]					
Ferronickel (nickel-cobalt content)	8,305	13,207	15,552	20,272	20,656
Matte (nickel-cobalt content)	14,146	13,298	15,816	14,153	13,840
Nonmetals: Giobertite [3]	12	1,007	755	635	1,418

p Preliminary. r Revised.
[1] Mine-run ore, about 25 percent water; nickel content 2.8–3.5 percent by dry analysis.
[2] Ferronickel grading 24–28 percent nickel-cobalt, mattes about 79 percent nickel-cobalt.
[3] Magnesian mineral used for refractories.

Source: Mines Service of New Caledonia.

Table 5.—New Caledonia: Exports of mineral commodities

(Metric tons)

Commodity	1966	1967	Principal destinations, 1967
Chromite	-------	1,233	All to Japan.
Iron ore	201,423	198,236	All to Australia.
Nickel ore	1,119,853	1,527,649	All to Japan.
Smelter products: [1]			
Ferronickel:			
Electric grade (FN4 grade, 25.1 percent nickel-cobalt).	6,998	7,767	France 5,085; United States 2,015.
Sulfur extracted (FN3 grade, 24.5 percent nickel-cobalt).	4,554	3,393	France 2,213.
Refined (FN2 grade, 26.3 percent nickel-cobalt).	185	174	All to France.
Overrefined (FN1 grade, 27.5 percent nickel-cobalt).	8,447	7,822	Do.
Matte: Nickel matte (79 percent nickel-cobalt)	14,349	12,983	France 5,878; Canada 4,447.

[1] Data in terms of contained nickel plus cobalt.

Source: Mines Service of New Caledonia.

COMMODITY REVIEW

Metals.—*Iron Ore.*—Of the 204,000 tons of iron ore produced at the Prony mine during 1967, 198,236 tons was exported to Australia. The mine is operated by a subsidiary of the Société le Nickel and the exported ore averaging 56.78 percent iron, 0.22 percent nickel, 3.18 percent chrom-

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Table 6.—New Caledonia: Imports of mineral commodities

(Metric tons)

Commodity	1964	1965	Principal sources, 1965
Metals:			
Iron and steel, semimanufactures	11,474	25,774	France 23,362; Australia 1,525.
Nonferrous metals, not further described	238	362	France 293; Australia 56.
Nonmetals:			
Cement, lime, dimension stone, and asbestos cement products.	26,917	38,806	Japan 20,360; France 16,917.
Clay bricks and tile	5,239	8,498	France 5,959; Austria 1,578.
Fertilizers, processed	439	488	France 390; Japan 36.
Sand, gravel, and crushed rock	57,561	46,187	Mexico 46,039; France 138.
Other nonmetals	670	709	France 385; Belgium-Luxembourg 90; Australia 85.
Mineral fuels:			
Coal, coke, and briquets	287,673	304,006	All from Australia.
Petroleum products	154,887	172,123	Australia 124,772; Malaysia 12,180; Iran 9,536.
Gas, natural and manufactured	925	1,659	Australia 1,211; Indonesia 210.

ium, and 7.09 percent moisture was presumably shipped as in the past to Broken Hill Pty. Co. Ltd.

Nickel.—Preliminary data on nickel ore production indicate that output totaled 3,800,000 tons in 1967, a new high. In 1966 production was 2,892,000 tons. Of the 1967 production 1,527,649 tons was exported; this averaged 2.94 percent combined nickel and cobalt content and 24.68 percent moisture. Le Nickel mines at Thio, Bornets, Kouaoua, Poro, and possibly Nepoui reported output of 2,836,000 tons in 1967 and 2,200,000 tons in 1966. The plant at Poro has been having problems pelletizing garnierite concentrates provided by the Poro and new Nepoui mines. Increased production of 15,000 tons of nickel by mid-1969 is scheduled at Le Nickel's Doniambo smelter as a result of adding a new large low shaft blast furnace.

New Caledonia's new nickel producing group includes Inco with 40 percent participation, the French Government's Bureau de Recherches Geologiques et Minieres (BRGM) at 30 percent, and an unspecified group of French companies (which may include Ugine-Kuhlmann, Mokta, various banks and metallurgical firms: Schneider and Chatillon-Commentary) at 30 percent. The new firm will process nickel laterite ore and therefore facilities are expected to be in the south at the site of laterite deposits.

NEW HEBRIDES

In 1967 Compagnie Francaise des Phosphates de l'Oceanie extracted 379,370 tons of manganese ore averaging 20 to 25 percent manganese from the Forari mine on Vate Island. Production totaled 71,400 tons of sintered concentrates (agglomerate) containing 49.29 percent manganese. Exports in 1967 totaled 72,746 tons of agglomerate of which the bulk was shipped to Japan and 8,801 tons to Italy. Production and exports during the past 5 years were as follows:

Year	Metric tons	
	Production	Exports
1963	25,416	23,319
1964	60,546	66,104
1965	66,710	r 81,650
1966	76,240	65,145
1967	71,400	72,746

r Revised.

In early 1967 an occurrence of native copper in association with copper sulfides was found in the Condominium by the Geological Survey of New Hebrides. It is expected that in the near future an Australian mining company will engage in geochemical sampling over an extensive area.

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PAPUA AND NEW GUINEA

Mineral production in the Australian administered territories of Papua and New Guinea has declined over the years and now consists of relatively small amounts of gold and silver. Besides the large land area lying north of Australia, the territories include the islands of Bougainville, New Britain, New Ireland, and Manus, as well as many small islands. Value of mineral output for the territories for the fiscal years ending June 30 totaled $1.1 million[3] in 1966, a decrease of $100,000 from that of 1965, and is estimated to be $1 million in 1967. In 1966 mineral production represented about 0.3 percent of the territorial gross national product estimated at $406 million. Mineral prospecting and exploration has been increasing and expectations for substantial copper production from the discovery on Bougainville appear good.

Although occurrences of gold, platinum, osmiridium, silver, copper, iron, lead, zinc, nickel, chromium, sulfur, gem stones, and low-grade coal have been found over the years, the growth of a mineral industry has been hindered by difficulties of inaccessibility of the hinterlands, dense forests, lack of outcrops, and mountainous terrain. Recently exploration problems at least have been lessened by use of techniques that combine geochemical and geophysical prospecting with helicopters and shallow-draft jet boats for transporting personnel.

The increase in prospecting permits during 1967 reflected increasing geologic investigations during 1967 and early 1968 by both the Government and foreign private mining interests. The Bureau of Mineral Resources surveyed parts of the Sepik, Morobe, and Central districts and participated in the study of Blanch Bay in New Britain. Kennecott Exploration (Australia) Pty. Ltd., Conzinc Riotinto (Australia) Exploration Pty. Ltd. (CRA), and Mount Isa Mines Ltd. prospected for copper and associated minerals in the Eastern and Western Highlands districts.

On Bougainville, CRA was intensively exploring its copper discovery at Panguna and prospecting other areas. On New Britain, American Smelting and Refining Co., U.S. Metals Refining Co., and Placer Development Ltd. were searching for copper on the Gazelle Peninsula, while in the central portion Placer Development Ltd. was studying geochemical copper anomalies. In Papua, Anaconda Australia Inc. was prospecting the Milne Bay area. Placer Development found copper anomalies on New Ireland and also near Ioma in the Northern district, while the Exoil-Transoil group reportedly made plans to prospect Manus Island for bauxite in early 1968. Interest waned toward magnetite beach sands on the Gulf of Papua because of high titanium content disclosed by sampling in 1966. Oil search continued during 1966 in the central delta of Papua and northwest New Guinea. The first offshore well was drilled in the Gulf of Papua in 1967 and two more followed in 1968 with the latter producing quantities of gas.

Statistics on mineral industry in Papua and New Guinea during recent years follow:

Fiscal year ending June 30 of year stated	Mineral areas held (acres)	Number of mines	Number of workers [1]	Value of mineral output
1963:				
Papua	976	18	345	$1,667
New Guinea	11,260	330	3,606	1,493,603
1964:				
Papua	929	26	544	1,370
New Guinea	11,339	358	3,508	1,511,639
1965:				
Papua	890	87	688	1,965
New Guinea	12,246	380	3,629	1,205,312
1966:				
Papua	881	86	557	1,978
New Guinea	10,590	399	3,915	1,058,681
1967:				
Papua	NA	NA	NA	NA
New Guinea	12,409	358	4,018	1,022,164

NA Not available.
[1] Includes workers employed in petroleum exploration.

[3] The territories of Papua and New Guinea adopted the Australian decimal currency (on the basis of 1£ equals A$2) concurrently with its introduction in Australia on February 14, 1966. The current exchange rate of about A$1 equals US$1.12 has been used to convert all values herein to U.S. dollars.

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The Papua-New Guinea House of Assembly passed amendments of the Mining Ordinances of Papua and of New Guinea during June and November 1966. Amendments in June provided encouragement for exploration, conditions for entry and protection of native land, occupation and damage compensation of land during prospecting or mining. In November, after much agitation, an amendment was passed to allow a direct royalty payment to landowners amounting to 5 percent. On February 7, 1967, the Australian Government approved the mineral royalty payments to landholders in the territories, but stated that this decision did not alter the general principle that mineral resources belong to all the people, not just the landholders.

PRODUCTION

Mineral production of Papua and New Guinea for recent calendar years follows:

Minerals	1963	1964	1965	1966	1967
Gold, troy ounces	43,599	38,977	32,494	28,106	27,671
Silver, do.	23,696	23,206	19,664	18,052	17,176
Platinum, do.	5	1	4	(1)	--------
Manganese ore, metric tons	3	2	--------	--------	--------

[1] Less than 1 unit.

TRADE

The trend in territorial trade during the fiscal years ending June 1965, 1966, and 1967 was as follows in million U.S. dollars:

	Mineral trade			Total trade		
	1965	1966	1967	1965	1966	1967
Exports	[1] 1.2	[1] 1.1	[1] 1.0	55.	55.8	59.6
Imports	10.7	12.5	14.1	96.	124.0	141.0
Trade balance	−9.5	−11.4	−13.1	−41.	−68.2	−81.4

[1] Excluding reexports.

In fiscal year 1966–67, gold bullion accounted for more than 99 percent of mineral exports. Imports of mineral commodities valued at $14.1 million were composed principally of iron and steel products ($5.2 million), fuels ($5.1 million), and nonmetallics ($2.2 million).

COMMODITY REVIEW

Metals. — *Copper.* — Conzinc Riotinto (Australia) Exploration Pty. Ltd. (CRA) has continued exploration of the low-grade "Porphyry" copper deposits in the Panguna Flats area of Bougainville, and in mid-1966 Broken Hill Consolidated Ltd. took a one-third interest in the project. Continuing drilling programs raised the ore reserve estimate to 234 million metric tons averaging 0.63 percent copper and 0.022 troy ounce of gold per ton. Bulk sampling was supplementing drill core sampling and included a tunnel to be completed in November 1968. The Bougainville Copper Pty. Ltd. was formed in 1967 to operate the mining venture. Cost of developing the deposit to the production stage is estimated at $112 million and feasibility studies were being conducted by engineering consultants. Completion and evaluation of these studies was scheduled for mid-1969, when a decision will be made regarding development of an open pit mine and related facilities. If the project proves feasible, a plant will be constructed to treat 10 million tons of crude ore annually which by 1971 will produce 81,000 tons of copper annually. Forty percent of the copper would be marketed in Europe and the rest in Japan. Reportedly CRA has also made substantial copper discoveries in New Britain and was exploring in New Guinea.

Gold.—All gold dredging ceased in 1965 in New Guinea. For the year ending June 30, 1967, 45 percent of gold production was from alluvial workings panned by natives, mostly in the Morobe district, and 55 percent was from lode mining. Lode

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mining is done on a small scale at Wau, Edie Creek, and Kainantu and silver was produced in association with gold.

On Misima Island, situated off the easternmost tip of Papua, Pacific Island Mines Ltd. of Australia in association with Cultus Explorations Ltd. of Canada have been financing further exploration of the Umana lode. Despite enthusiastic reports of gold and high-grade lead-zinc ore since 1965 and extensive underground work between 1966 and 1968, the lode had not been located in depth. In early 1968 after an evaluation by consultants (K. McMahon and Partners Pty. Ltd.) exploration for gold was suspended temporarily and investigations were directed toward copper anomalies occurring outside the limits of the Umana lode. The Cultus Pacific N.L. company was formed in April 1968 to pursue the search for copper.

Mineral Fuels.—*Gas.*—Australasian Petroleum Co.'s gas resources in the Gulf district of Papua still remains unexploited despite reserves which exceed a cautious minimum of 40 billion to an optimistic 500 billion cubic feet. Australasian is jointly owned by British Petroleum, Mobil, and Oil Search Ltd. The first offshore well in Papua and New Guinea was drilled in November 1967 by Phillips Australian Oil Co. This well, Borabi No. 1 was 65 kilometers from the mouth of the Turama River, but was abandoned at a depth of 2,880 meters. A second well in the Gulf of Papua, Uramu No. 1 was drilled in Deception Bay and after its abandonment was followed by Uramu No. 1A nearby. In February 1968, Uramu No. 1A produced 22.4 million cubic feet of gas from 1,880 meters and was completed at 3,082 meters in March. Because of the infeasibility of piping this gas to Australian centers, it may eventually be liquified and shipped to Japan or the United Kingdom. Phillips plans to drill Orokolo No. 1 south of the Vailala River and defer drilling in Deception Bay during the southeast monsoon which ends in October.

Petroleum.—No oil has been found so far in Papua and New Guinea. In the central delta, Oil Search Ltd. has been active, and Japan Petroleum Exploration Co. (JAPEX) was exploring with Australian Aquitaine in northwestern New Guinea. British Petroleum, Oil Search, and Mobil were investigating locations in the Southern Highlands. Continental Oil was searching New Britain and New Ireland. Nakoro Petroleum Corp. Ltd. was exploring in the central delta area and United Geophysical Corp. was working in the Gulf and Western districts. Esso Exploration had plans to drill its first well in August 1968 on Ini Island, 20 kilometers from Phillips' Uramu No. 1A well. An application to prospect 26,000 square kilometers in the Fly River region of the Western district was made by the California Asiatic Oil Co. and the Texaco Overseas Petroleum Co. in early 1968.

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